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EPA Region 5 Records Ctr.

225798

POWER/CRSS

REPORT

Report of Environmental Investigation

Proposed Northwestern Memorial Hospital
Facility Redevelopment Site
Chicago, Illinois

STS Consultants Ltd.
Consulting Engineers

CLIENT	LOG OF BORING NUMBER
Power/CRSS	B-101
PROJECT NAME	**ARCHITECT-ENGINEER**
Northwestern Memorial Hospital	Ellerbe Beckett/HOK

STS Consultants Ltd.

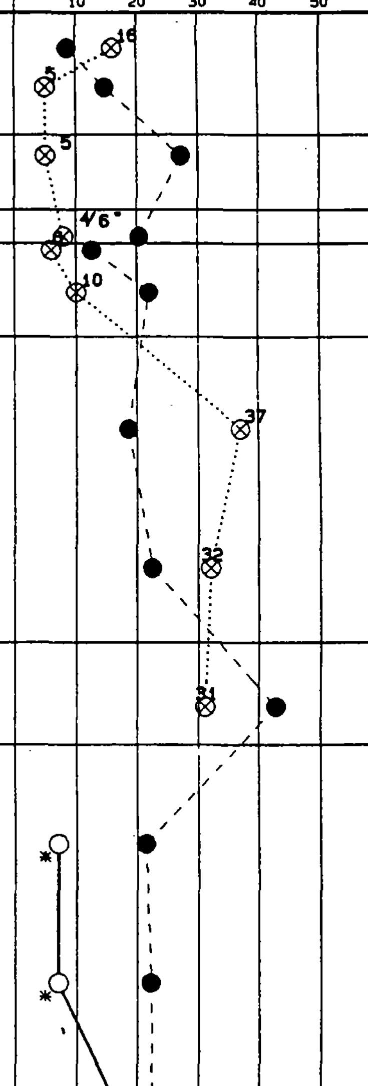
SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % × — WATER CONTENT % ● — LIQUID LIMIT % △: 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
			PA			Fill: Silty fine to medium sand, little gravel and brick, trace cinders and glass - gray and reddish brown - medium dense to loose - moist (SM)		
		1	SS					<1
		2	SS					<1
			PA					
5.0		3	SS			Fill: Silty clay, little brick, trace gravel and sand - gray and reddish brown (CL)		<1
			PA					
			RB					
		4	SS*			Fill: Cinders, little silt, gravel and sand, trace brick - black - loose - moist (SM)		<1
		4A	SS			Fill: Silty fine to medium sand, trace gravel and brick - brown to brownish gray - loose - moist (SM)		<1
10.0			RB					
		5	SS					<1
			RB			Silty fine sand, little gravel - brown - dense - saturated (SM)		
15.0		6	SS					<1
			RB					
20.0		7	SS					<1
			RB					
						Silty fine sand, trace clay, gravel and peat - dark gray and slightly black - dense - saturated (SM)		
25.0		8	SS			Note: Sample 8 - slightly organic.		<1
			RB			Silty clay, trace gravel, sand and shale - gray - medium to very stiff (CL)		
30.0		9	ST					
			RB					
35.0		10	ST					
			RB					
40.0								



* Calibrated Penetrometer

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The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

STS JOB NO. 27313

STS Consultants Ltd.

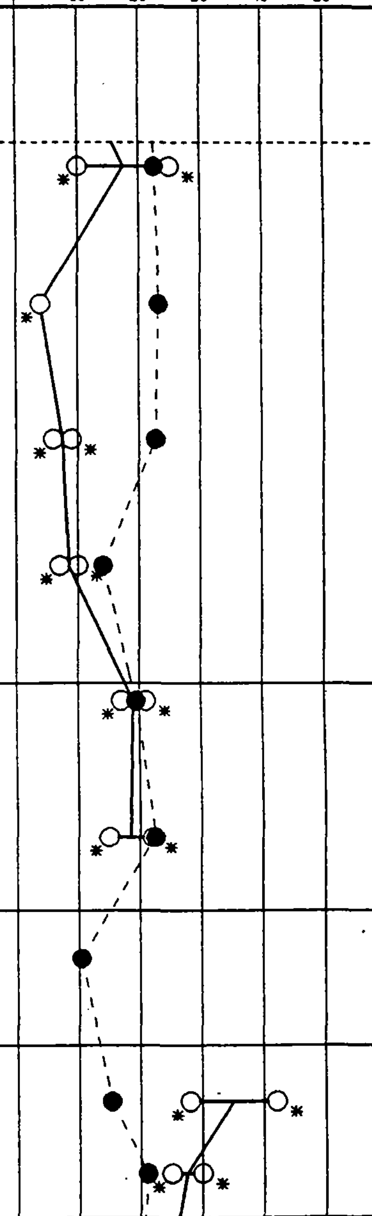
CLIENT	Power/CRSS
LOG OF BORING NUMBER	B-101
PROJECT NAME	Northwestern Memorial Hospital
ARCHITECT-ENGINEER	Ellerbe Beckett/HOK
SITE LOCATION	Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
						Continued from previous page		
40.0		11	ST			Silty clay, trace gravel, sand and shale - gray - medium to very stiff (CL)		
			RB					
45.0		12	ST				105	
			RB					
50.0		13	ST					
			RB					
55.0		14	ST					
			RB					
60.0		15	ST			Silty clay, trace gravel, sand and shale - gray - stiff to very stiff (CL)		
			RB					
65.0		16	ST					
			RB			Silty fine to coarse sand, little gravel, trace clay - gray - moist (SM)		
70.0		17	ST					
			RB			Silty clay, trace gravel, sand and shale - gray - very stiff to hard (CL)		
75.0		18	ST					
			RB					
		19	ST					
80.0			RB			Silty clay, trace gravel, sand and shale - gray - very stiff (CL-ML)		



* Calibrated Penetrometer

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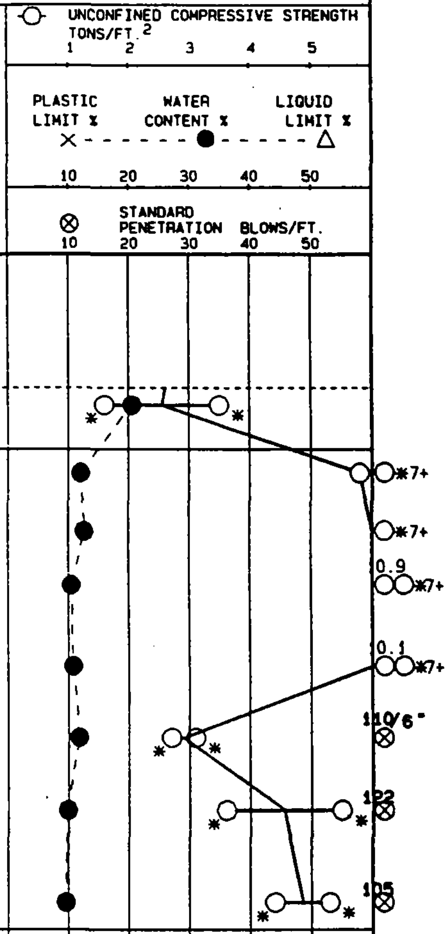
STS Consultants Ltd.

CLIENT	Power/CRSS
LOG OF BORING NUMBER	B-101
PROJECT NAME	Northwestern Memorial Hospital
ARCHITECT-ENGINEER	Ellerbe Beckett/HOK
SITE LOCATION	Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
						Continued from previous page		
80.0		20	ST			Silty clay, trace gravel, sand and shale - gray - very stiff (CL-ML)		
			RB					
		21	ST			Silty clay, little sand, trace gravel and shale - gray - very stiff to hard (CL)	128	
85.0			RB					
		22	ST					
			RB					
		23	ST				130	
			RB					
90.0		24	ST				132	
			RB					
		25	SS					
95.0			RB					
		26	SS					
			RB					
100.0		27	SS					

End of Boring
Borehole grouted upon completion.
Casing used: 30 ft. of 4 in

SS* = Standard penetration value based on first 6 inches of driving.



* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 8 ft WS OR WD	BORING STARTED 07/13/92	STS OFFICE Northbrook-01	
WL BCR 29 ft ACR	BORING COMPLETED 07/13/92	ENTERED BY KKB	SHEET NO. 3 OF 3
WL	RIG/FOREMAN B-61/DG	APP'D BY MAK	STS JOB NO. 27313

STS Consultants Ltd.	CLIENT: Power/CRSS	LOG OF BORING NUMBER	B-102
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett/HOK	

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

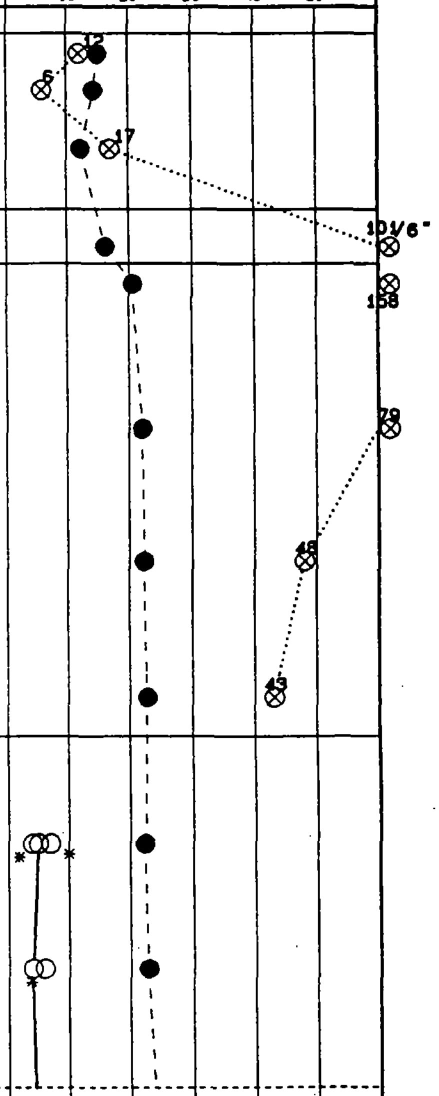
UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
		PA	Driller's observation: 3 in. asphalt, 9 in. stone fill		
	1	SS	Fill: Silty fine to medium sand, little gravel, trace cinders - brown and reddish brown - loose to medium dense - moist (SM)		<1
	2	SS			<1
5.0		PA			
	3	SS			<1
		RB			
	4	SS	Fill: Silty fine to medium sand, little gravel, trace clay - orange-brown and slightly gray - extremely dense (SM)		<1
10.0		PA			
	5	SS	Silty fine sand, trace clay and gravel - brown to brownish gray - extremely dense to dense - saturated (SM)		<1
		PA			
15.0	6	SS			<1
		RB			
20.0	7	SS			<1
		RB			
25.0	8	SS			<1
		RB	Silty clay, trace gravel, sand and shale - gray - soft to stiff (CL)		
30.0	9	ST		109	
		RB			
35.0	10	ST		110	
		RB			
40.0					



* Calibrated Penetrometer

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The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

STS JOB NO. 27313

STS Consultants Ltd.	CLIENT: Power/CRSS	LOG OF BORING NUMBER: B-102
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

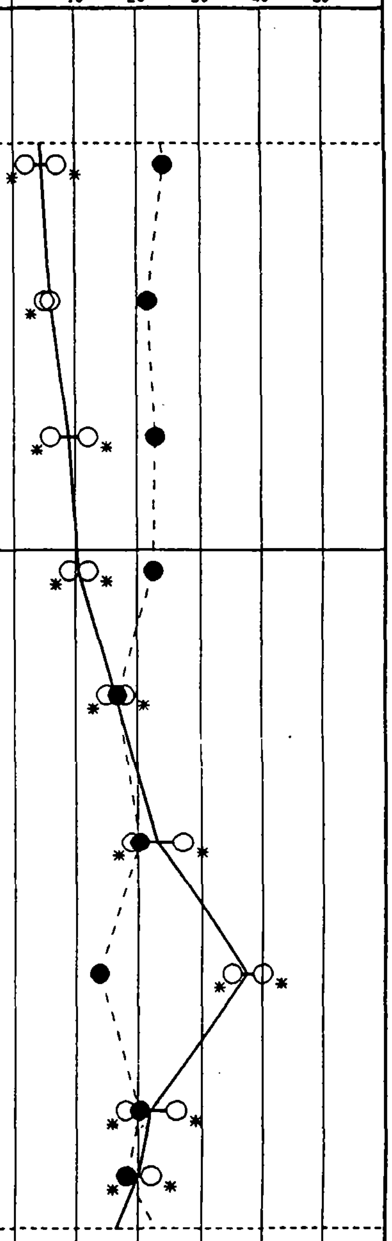
SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % (×) — WATER CONTENT % (●) — LIQUID LIMIT % (△): 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
						Continued from previous page		
40.0		11	ST			Silty clay, trace gravel, sand and shale - gray - soft to stiff (CL)	112	
			RB					
45.0		12	ST					
			RB					
50.0		13	ST					
			RB					
55.0		14	ST			Silty clay, trace gravel, sand and shale - gray - stiff to very stiff (CL)		
			RB					
60.0		15	ST					
			RB					
65.0		16	ST					
			RB					
70.0		17	ST					
			RB					
75.0		18	ST					
			RB					
		19	ST					
80.0			RB					



* Calibrated Penetrometer

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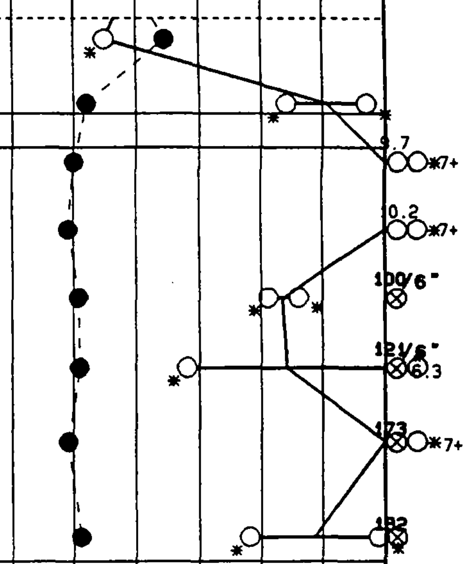
STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
Power/CRSS	B-102
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50
STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
						Continued from previous page		
80.0		20	ST			Silty clay, trace gravel, sand and shale - gray - stiff to very stiff (CL)		
			RB					
		21	ST					
						Clayey silt, little sand, trace gravel and shale - gray - hard (ML-CL)		
85.0			RB					
		22	ST			Silty clay, little sand, trace gravel and shale - gray - very stiff to hard (CL)	134	
			RB					
		23	ST				130	
			RB					
90.0		24	SS					
			RB					
		25	SS					
			RB					
95.0		26	SS					
			RB					
		27	SS					
100.0						End of Boring Borehole grouted upon completion. Casing used: 30 ft. of 4 in.		



* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL	WS OR WD	BORING STARTED	STS OFFICE	
9 ft		07/14/92	Northbrook-01	
WL BCR	ACR	BORING COMPLETED	ENTERED BY	SHEET NO. OF
	21 ft	07/14/92	KKB	3 OF 3
WL		RIG/FOREMAN	APP'D BY	STS JOB NO.
		B-61/DT	MAK	27313

STS Consultants Ltd.

CLIENT	Power/CRSS
LOG OF BORING NUMBER	B-103
PROJECT NAME	Northwestern Memorial Hospital
ARCHITECT-ENGINEER	Ellerbe Beckett/HOK
SITE LOCATION	Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Driller's observation: 3 in. asphalt, 4 in. stone fill			
	1	SS	Fill: Silty fine to medium sand, trace gravel, mortar, brick, cinders and miscellaneous rubble - dark grayish brown - medium dense to loose - moist (SM)		1	17
	2	SS			2	4
5.0		PA				
	3	SS	Fill: Cinders, trace sand and brick - black - loose - moist (SM)		1	5
		PA				
	4	SS	Fill: Broken concrete, little silt and sand - light gray - moist (GM)		2	73
10.0		PA				
	5	SS	Possible fill: Fine sand, little silt, trace cinders - brown and slightly gray - dense - moist (SP)		1	31
		PA	Silty fine sand, trace gravel - brown to brownish gray - dense - saturated (SM)			
15.0	6	SS			<1	46
		RB				
20.0	7	SS			<1	39
		RB				
25.0	8	SS			<1	43
		RB				
30.0	9	SS			<1	32
		RB	Silty clay, trace gravel, sand and shale - gray - medium to stiff (CL)			
35.0	10	ST		109		* *
		RB				
40.0						

* Calibrated Penetrometer

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STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
Power/CRSS	B-103
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett/HOK

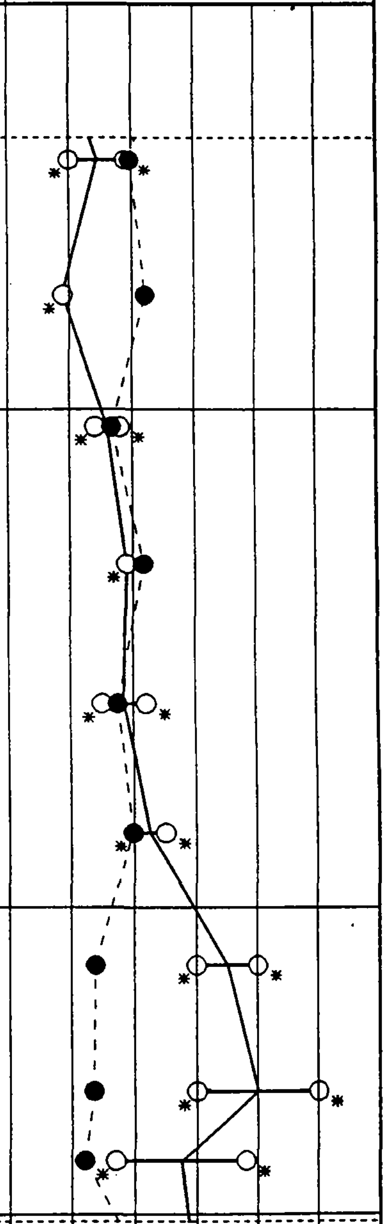
SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
						Continued from previous page		
40.0		11	ST			Silty clay, trace gravel, sand and shale - gray - medium to stiff (CL)		
			RB					
45.0		12	ST					
			RB					
50.0		13	ST			Silty clay, trace gravel, sand and shale - gray - stiff to very stiff (CL)		
			RB					
55.0		14	ST					
			RB					
60.0		15	ST					
			RB					
65.0		16	ST					
			RB			Silty clay, trace gravel, sand and shale - gray - stiff to hard (CL)		
70.0		17	ST			Note: Sample 19-irregular sand lenses.		
			RB					
75.0		18	ST					
			RB					
		19	ST					
80.0			RB			Silty clay, trace gravel, sand and shale - gray - very stiff (CL)		



* Calibrated Penetrometer

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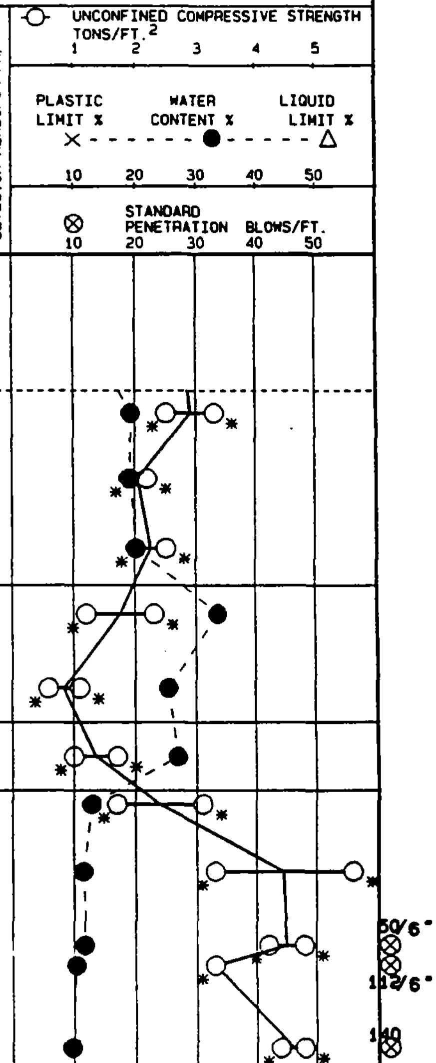
The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
Power/CRSS	B-103
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
						Continued from previous page		
80.0		20	ST			Silty clay, trace gravel, sand and shale - gray - very stiff (CL).		
			RB					
		21	ST					
85.0			RB					
		22	ST					
			RB					
		23	ST			Silty clay - gray - very stiff to medium (CL-CH)		
90.0			RB					
		24	ST					
			RB					
		25	ST			Clayey silt, trace gravel, sand and shale - gray - stiff (ML-CL)		
95.0			RB					
		26	ST			Silty clay, some sand, trace gravel and shale - gray - stiff to hard (CL)		
			RB			Driller's note: Boulders or obstructions from 95.5 to 96 ft.		
		27	ST			Sample 27 - badly disturbed.		
			RB					
100.0		28	SS					
		28A	SS					
			RB					
105.0		29	SS					
						End of Boring		
						Borehole grouted upon completion.		
						Casing used: 30 ft. of 4 in.		



* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 14 ft WS OR WD	BORING STARTED 07/15/92	STS OFFICE Northbrook-01
WL BCR ACR	BORING COMPLETED 07/15/92	ENTERED BY KKB / SHEET NO. 3 OF 3
WL	RIG/FOREMAN B-61/DT	APP'D BY MAK / STS JOB NO. 27313

CLIENT	LOG OF BORING NUMBER
Power/CRSS	B-104
PROJECT NAME	**ARCHITECT-ENGINEER**
Northwestern Memorial Hospital	Ellerbe Beckett/HOK

STS Consultants Ltd.

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
			SURFACE ELEVATION			
		PA	Driller's observation: 2 in. asphalt, 2 in. crushed stone fill			
	1	SS	Fill: Cinders, some brick, little sand - dark gray and reddish brown - medium dense - moist (SM)		1	13
	2	SS			1	28
5.0		PA	Fill: Silty fine to medium sand, little clay, trace gravel, cinders and glass - brownish gray - medium dense - moist (SM)			
	3	SS	Fill: Silty clay, little sand and brick, trace gravel and cinders - grayish brown - medium (CL)		1	3
		PA				
	4	SS	Fill: Silty fine to medium sand, little wood, trace clay, brick, cinders and mortar - brownish gray - loose - moist (SM)		1	6
10.0		PA				
	5	SS	Silty fine sand, some gravel - brown - dense - moist (SM)		1	30
		PA				
15.0			Silty fine to very fine sand, trace gravel - brown to gray - dense - saturated (SM)			
	6	SS			<1	49
		RB				
20.0	7	SS			1	48
		RB				
25.0	8	SS			<1	45
		RB				
30.0	9	SS			<1	23
		RB	Silty clay, trace gravel, sand and shale - gray - medium to very stiff (CL)			
35.0	10	ST		108		
	10A	ST				
		RB				
40.0						

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50
STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

* Calibrated Penetrometer

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The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

STS JOB NO. 27313 | SHEET NO. 1 OF 3

STS Consultants Ltd.

CLIENT: Power/CRSS

LOG OF BORING NUMBER: B-104

PROJECT NAME: Northwestern Memorial Hospital

ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

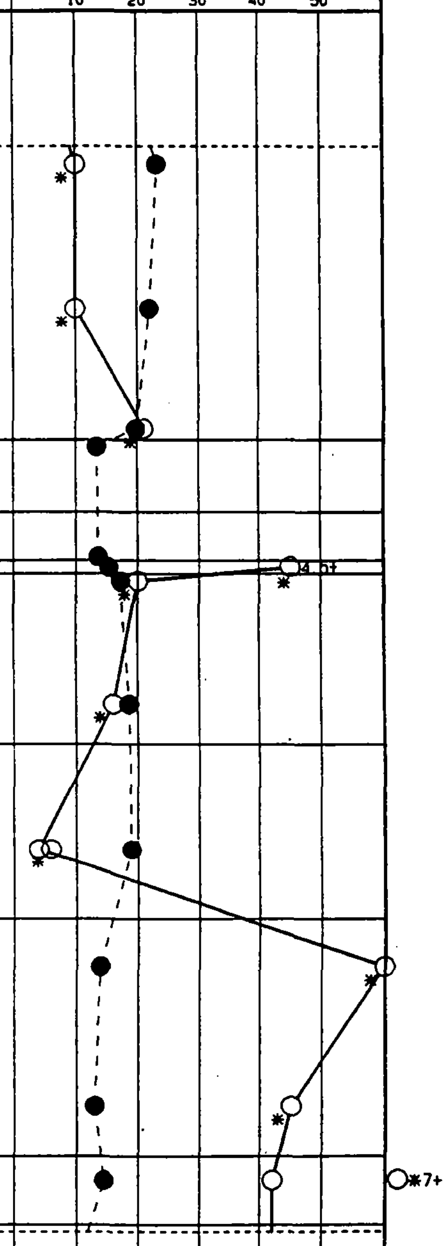
SITE LOCATION: Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

DEPTH (FT) / ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
			SURFACE ELEVATION		
			Continued from previous page		
40.0	11	ST	Silty clay, trace gravel, sand and shale - gray - medium to very stiff (CL)		
		RB			
45.0	12	ST			
		RB			
50.0	13	ST			
	13A	ST	Clayey silt, little sand, trace gravel - gray - moist (ML-CL)		
		RB	Silty fine sand, little clay - gray - moist to wet (SM)		
55.0	14	ST	Note: Irregular clay lenses.		
	14A	ST			
	14B	ST	Clayey silt, trace gravel, sand and shale - gray - hard - moist (ML-CL)		
		RB	Silty clay, trace gravel, sand and shale - gray - very stiff to stiff (CL)		
60.0	15	ST			
		RB	Silty clay, trace gravel, sand and shale - gray - soft (CL) Note: Sample 16 - unit dry weight = 113 pcf.		
65.0	16	ST		113	
		RB	Silty clay, trace gravel, sand and shale - gray - hard (CL) Note: Sample 18 - irregular sand seam.		
70.0	17	ST			
		RB			
75.0	18	ST			
		RB			
	19	ST	Clayey silt, trace gravel, sand and shale - gray - hard (ML-CL)	120	
80.0		RB	Silty clay, little sand, trace gravel and shale - gray (CL)		



* Calibrated Penetrometer

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The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

STS JOB NO. 27313

STS Consultants Ltd.	CLIENT: Power/CRSS	LOG OF BORING NUMBER: B-104
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

-O- UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % × - - - WATER CONTENT % ● - - - LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
						Continued from previous page		
80.0		20	ST			Silty clay, little sand, trace gravel and shale - gray (CL)	131	
		20A	ST			Silt, little clay, trace gravel, sand and shale - gray - moist (ML)		
			RB					
		21	ST			Silty clay, little sand, trace gravel and shale - gray - very stiff to hard (CL)	130	
85.0			RB					
		22	ST				131	
			RB					
		23	ST				129	
			RB					
90.0		24	ST					
			RB					
		25	SS					
			RB					
95.0		26	SS					
			RB					
100.0		27	SS					

Values printed at right edge of chart (top to bottom): 6.7; 6.8, *7+; 8.3, *7+; 9.6, *7+; *7+; 147/6"; 101/2"; 109, 6.4

End of Boring
Borehole grouted upon completion.
Casing used 30 ft. of 4 in.

* Calibrated Penetrometer

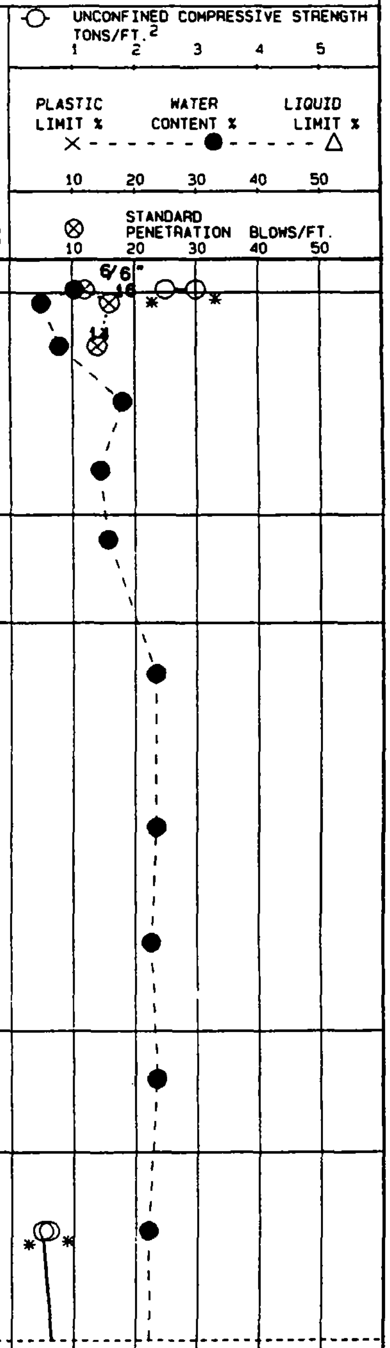
The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13.5 ft WS OR WD	BORING STARTED 07/16/92	STS OFFICE Northbrook-01
WL BCR ACR	BORING COMPLETED 07/16/92	ENTERED BY KKB — SHEET NO. 3 OF 3
WL	RIG/FOREMAN B-61/DT	APP'D BY MAK — STS JOB NO. 27313

STS Consultants Ltd.	CLIENT: Power/CRSS	LOG OF BORING NUMBER: B-105
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
				SURFACE ELEVATION		
			PA	Fill: Silty clay, trace gravel, sand, topsoil, cinders and brick - brown and slightly black - very stiff (CL)		
		1	SS			<1
		1A	SS	Fill: Silty fine sand, trace gravel, brick cinders and mortar - brown and slightly black - medium dense - moist to wet (SM)		<1
			PA			
		2	SS			<1
5.0			PA	Note: Sample 3 - little topsoil.		
		3	SS			<1
			PA			
		4	SS			<1
10.0			PA	Silty fine to medium sand, trace gravel - brown - saturated (SM)		
		5	SS			<1
			RB	Silty fine sand, trace gravel - brown to gray - saturated (SM)		
15.0		6	SS			<1
			RB			
20.0		7	SS			<1
			RB			
25.0		8	SS			<1
			RB	Silty fine sand, little clay, trace gravel and coarse sand - gray - saturated (SM)		
30.0		9	SS			<1
			RB	Silty clay, trace gravel, sand and shale - gray - medium to soft (CL)		
35.0		10	ST		108	
			RB	**Field vane at 37.5 ft.**		
			RB	**s_u = 1264 psf**		
40.0						



* Calibrated Penetrometer

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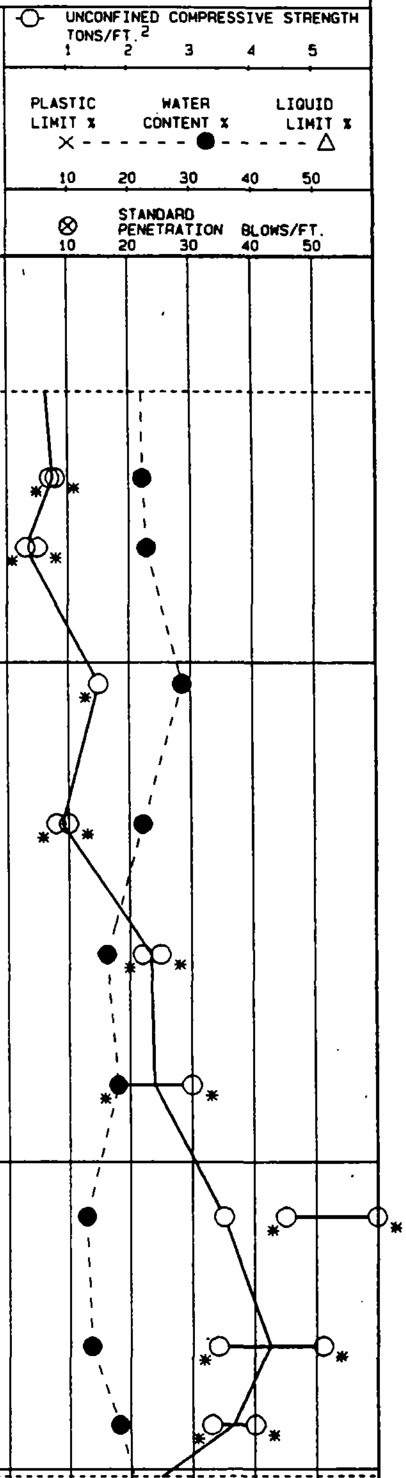
STS Consultants Ltd.	CLIENT: Power/CRSS	LOG OF BORING NUMBER: B-105
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION		
						Continued from previous page		
40.0			RB			Silty clay, trace gravel, sand and shale - gray - medium to soft (CL)		
		11	SS					
45.0			RB					
		12	ST				105	
			RB					
50.0		13	ST			Silty clay, trace gravel, sand and shale - gray - medium to very stiff (CL)		
			RB					
55.0		14	ST					
			RB					
60.0		15	ST					
			RB					
65.0		16	ST					
			RB					
70.0		17	ST			Silty clay, little sand, trace gravel and shale - gray - very stiff to hard (CL)	129	
			RB					
75.0		18	ST					
			RB					
		19	ST					
80.0			RB			Silty clay, trace gravel, sand and shale - gray - very stiff to stiff (CL)		



* Calibrated Penetrometer

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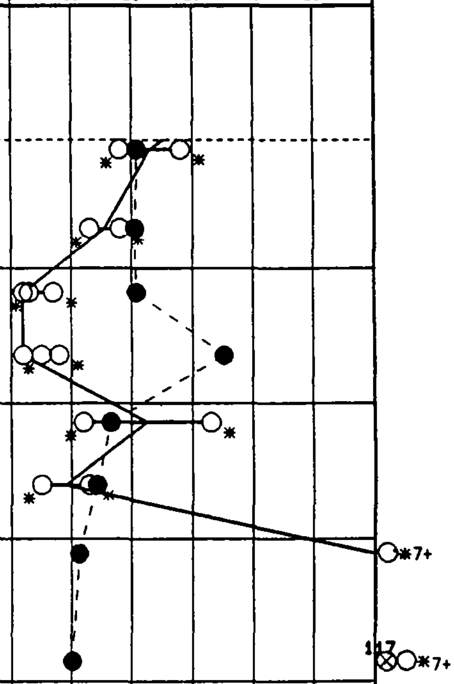
The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

STS JOB NO. 27313 | SHEET NO. 2 OF 3

STS Consultants Ltd.	CLIENT: Power/CRSS	LOG OF BORING NUMBER: B-105
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³	PHOTO-IONIZATION DETECTOR READING (PPM)
			SURFACE ELEVATION		
			Continued from previous page		
80.0	20	ST	Silty clay, trace gravel, sand and shale - gray - very stiff to stiff (CL)		
		RB			
	21	ST			
85.0		RB			
	22	ST	Silty clay, trace gravel, sand and shale - gray - very soft to medium (CL)	108	
		RB			
	23	ST		85	
90.0		RB			
	24	ST	Silty clay, trace gravel, sand and shale - gray - very stiff to medium (CL)		
		RB			
	25	ST			
95.0		RB			
	26	ST	Silty clay, little sand, trace gravel and shale - gray - hard (CL)		
		RB			
100.0	27	SS			
			End of Boring Borehole grouted upon completion. Casing used: 40 ft. of 4 in.		



The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL	WS OR WD	BORING STARTED 07/17/92	STS OFFICE Northbrook-01	
WL 12 ft	BCR ACR	BORING COMPLETED 07/17/92	ENTERED BY KKB	SHEET NO. 3 OF 3
WL		RIG/FOREMAN B-61/DT	APP'D BY MAK	STS JOB NO. 27313

STS Consultants Ltd.

CLIENT: Power/CRSS

PROJECT NAME: Northwestern Memorial Hospital

LOG OF BORING NUMBER: B-106

ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

SITE LOCATION: Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

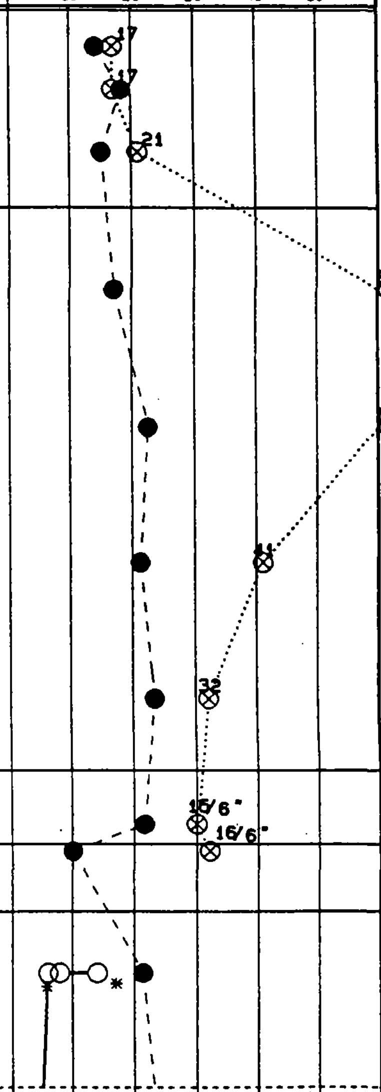
UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1, 2, 3, 4, 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10, 20, 30, 40, 50)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50)

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
		RB	Driller's observation: 2 in. asphalt		
	1	SS	Fill: Cinders, little sand, trace brick - black and dark brown - medium dense - moist (SM)		2
	2	SS			2
5.0		RB			
	3	SS			1
		RB	Silty fine sand - brown - very dense to dense - saturated (SM)		
10.0	4	SS			2
		RB			
15.0	5	SS			<1
		RB			
20.0	6	SS			<1
		RB			
25.0	7	SS			<1
		RB	Silty very fine sand, little fine gravel, trace clay - brown and gray - dense - saturated (SM-ML)		
30.0	8	SS			1
	8A	SS	Silty fine to coarse sand, little fine gravel - brown and gray - saturated (SM)		1
		RB			
35.0			Silty clay, trace gravel, sand and shale - gray - medium (CL)		
	9	ST		108	
		RB			
		VS	**Field vane at 37.5 ft.**		
		RB	**s_u = 1374 psf**		
40.0					



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STS Consultants Ltd.	CLIENT Power/CRSS	LOG OF BORING NUMBER B-106
	PROJECT NAME Northwestern Memorial Hospital	ARCHITECT-ENGINEER Ellerbe Beckett/HOK

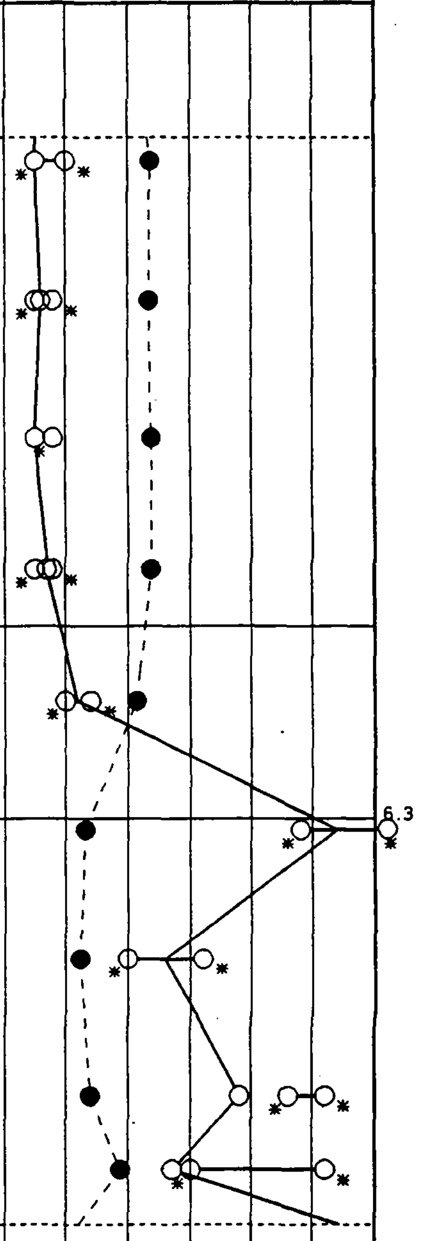
SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	UNIT DRY WT. LBS./FT.^{3}	PHOTO-IONIZATION DETECTOR READING (PPM)
				Continued from previous page		
40.0		10	ST	Silty clay, trace gravel, sand and shale - gray - medium (CL)	106	
			RB VS	Field vane at 42.5 ft. $s_u = 1319$ psf		
			RB			
45.0		11	ST		108	
			RB VS	Field vane at 47.5 ft. $s_u = 1066$ psf		
			RB			
50.0		12	ST		107	
			RB			
55.0		13	ST		106	
			RB	Silty clay, trace gravel, sand and shale - gray - stiff (CL)		
60.0		14	ST			
			RB			
65.0		15	ST	Silty clay, trace gravel, sand and shale - gray - very stiff to hard (CL)		
			RB			
70.0		16	ST			
			RB			
75.0		17	ST		123	
			RB			
		18	ST		112	
80.0			RB			



* Calibrated Penetrometer

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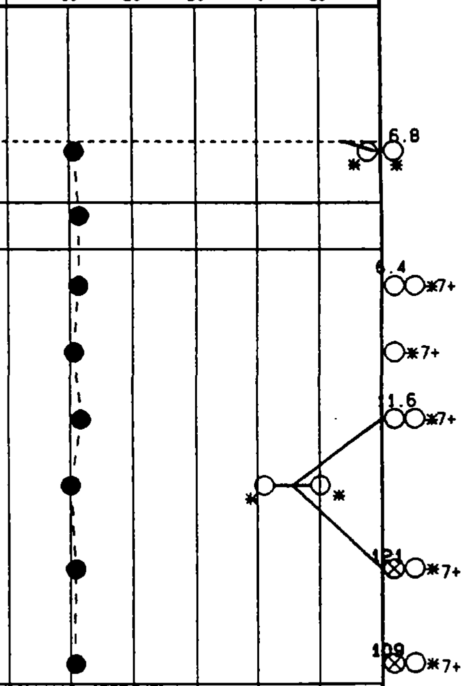
The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
Power/CRSS	B-106
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³	PHOTO-IONIZATION DETECTOR READING (PPM)
			SURFACE ELEVATION		
			Continued from previous page		
80.0	19	ST	Silty clay, trace gravel, sand and shale - gray - very stiff to hard (CL)		
		RB			
	20	ST	Clayey silt, little sand, trace gravel - gray - moist (ML)		
		RB			
85.0	21	ST	Silty clay, little sand, trace gravel and shale - gray - hard (CL)	131	
		RB			
	22	ST		132	
		RB			
90.0	23	ST			
		RB			
	24	ST			
		RB			
95.0	25	SS			
		RB			
100.0	26	SS			
			End of Boring Borehole grouted upon completion. Casing used 35 ft. of 4 in.		



* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL WS OR WD	BORING STARTED 07/17/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/22/92	ENTERED BY KKB	SHEET NO. 3 OF 3
WL	RIG/FOREMAN B-61/DT	APP'D BY MAK	STS JOB NO. 27313

STS Consultants Ltd.

CLIENT: POWER/CRSS	LOG OF BORING NUMBER: B-107
PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett HOK
SITE LOCATION: Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
			PA	Asphalt - gravel subbase		
		1	SS	Sand and rubble fill, trace to little bricks, sand, gravel, wood and cinders - brownish gray - medium dense - moist (Rubble fill)	14.2	3
		2	SS		1.2	10
5.0			PA			
		3	SS		0.2	11
			PA			
		4	SS	Fine to medium sand, little silt, trace gravel, rubble and wood - gray and dark gray - medium dense - moist and saturated (Fill - SM)	21.2	20
10.0			PA			
		5	SS	Note: Strong petroleum odor between 7.5 - 14.5 ft	14.0	55
			PA			
		6	SS		14.1	40
15.0			PA			
		7	SS	Fine sand, little silt, trace gravel and shales - gray and tan - dense - saturated (SM)	2.0	57
			PA			
20.0		8	SS		0.0	32
			PA			
25.0		9	SS		0.0	46
			PA			
30.0		10	SS	Silty clay, trace gravel and sand - gray - saturated (CL)	0.0	3
			PA			
35.0		11	SS		0.0	
37.0				End of Boring Borehole grouted upon completion		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13.5 ft WS OR WD WS	BORING STARTED 07/22/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/22/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL 10 ft AB	RIG/FOREMAN DR-9/Deon/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT: POWER/CRSS	LOG OF BORING NUMBER: B-108
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
			PA	Asphalt - gravel subbase		
		1	SS	Bricks, cinders, little to trace sand, gravel, miscellaneous debris and wood - brown and gray - loose to medium dense - desiccated and moist (Rubble fill)	0.6	11
		2	SS		0.0	10
5.0			PA			
		3	SS		1.2	6
			PA			
		4	SS		0.4	7
		4A	SS	Fine sand, little silt, trace gravel - brown - medium dense - moist to saturated (Fill - SM)	0.0	14
10.0			PA	Note: Strong petroleum odor and staining between 11 and 15 ft. Sample S-6 retained for chemical testing.		
		5	SS		0.1	13
			PA			
		6	SS		20.9	25
15.0			PA	Fine sand, little silt, trace gravel - gray - medium dense - saturated (SM)		
		7	SS		0.2	17
			PA			
		8	SS		0.0	26
20.0				End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13.5 ft WS OR WD WS	BORING STARTED 07/23/92	STS OFFICE Northbrook-01
WL BCR ACR	BORING COMPLETED 07/23/92	ENTERED BY MG — SHEET NO. 1 OF 1
WL 11 ft AB	RIG/FOREMAN DR-9/Mike/Dumas	APP'D BY DLG — STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
POWER/CRSS	B-109
PROJECT NAME	**ARCHITECT-ENGINEER**
Northwestern Memorial Hospital	Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
						SURFACE ELEVATION		
			PA			Asphalt - gravel subbase		
		1	SS			Cinders, bricks, wood, peat, sand and gravel - brown and dark gray - loose to medium dense - moist (Rubble fill)	1.0	8
		2	SS				70.9	4
5.0			PA					
		3	SS				20.1	7
		3A	SS			Fine to coarse sand, little silt, trace gravel - brown and dark gray - medium dense to dense - moist to saturated (Fill - SM)		15
			PA					
		4	SS			Note: Slight to strong petroleum odor and staining between 6 and 16 ft. Sample S-5 and S-6 retained for chemical testing.	50.2	10
10.0			PA					
		5	SS				60.2	32
			PA					
		6	SS				60.2	33
15.0			PA					
		7	SS				30.1	10
		7A	SS			Fine and coarse sand, trace silt - brown - medium dense to dense - saturated (SM-SW)	1.0	17
			PA					
		8	SS				0.0	37
20.0						End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 14 ft	WS OR WD WS	BORING STARTED 07/23/92	STS OFFICE Northbrook-01	
WL BCR	ACR	BORING COMPLETED 07/23/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL		RIG/FOREMAN DR-9/Mike/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT POWER/CRSS	LOG OF BORING NUMBER . B-110
	PROJECT NAME Northwestern Memorial Hospital	ARCHITECT-ENGINEER Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - gravel subbase		
	1	SS	Bricks, cinders, sand, gravel and wood - loose to medium dense - gray and dark gray - moist (Rubble fill)	0.2	17
	2	PA		0.0	16
5.0		PA			
	3	SS		0.2	7
		PA			
	4	SS		0.0	12
10.0		PA	Fine to medium sand, trace silt and gravel - gray - dense - wet and saturated (Fill - SM) Note: Sample S-6 retained for analytical testing.		
	5	SS		0.0	36
		PA			
	6	SS		0.0	37
15.0		PA			
	7	SS		0.0	55
		PA			
	8	SS		0.0	69
20.0			End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13.5 ft WS OR WD WS	BORING STARTED 07/23/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/23/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-9/Mike/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT: POWER/CRSS		LOG OF BORING NUMBER: B-111	
PROJECT NAME: Northwestern Memorial Hospital		ARCHITECT-ENGINEER: Ellerbe Beckett HOK	

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL SURFACE ELEVATION	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
			PA			Asphalt - gravel subbase		
		1	SS			Fill: Bricks, cinders, sand, gravel, wood, miscellaneous debris and clay - brown, black and gray - medium dense to dense (Rubble fill)	0.0	64
		2	SS				0.0	20
5.0			PA					
		3	SS				0.0	11
			PA					
		4	SS				0.0	33
		4A	SS				0.0	20/6"
10.0			PA			Fine to coarse sand, trace silt and gravel - brown and gray - dense to very dense - wet to saturated (Fill - SM) Note: Faint petroleum product odor between 12.5 and 17 ft.		
		5	SS				0.0	62
			PA					
		6	SS				0.0	41
15.0			PA					
		7	SS				0.0	35
			PA					
		8	SS				0.0	58
20.0						End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13 ft	WS OR WD WS	BORING STARTED 07/24/92	STS OFFICE Northbrook-01	
WL BCR	ACR	BORING COMPLETED 07/24/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL		RIG/FOREMAN DR-9/Deon/KEK	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	POWER/CRSS
LOG OF BORING NUMBER	B-112
PROJECT NAME	Northwestern Memorial Hospital
ARCHITECT-ENGINEER	Ellerbe Beckett HOK
SITE LOCATION	Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.[2]: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - gravel subbase underlain by concrete (augered) - desiccated (Fill)		
	1				
	2	SS	Fill: Cinders, brick, sand and gravel - brown and gray - medium dense (Rubble fill)	0.0	14
5.0		PA			
	3	SS		0.0	19
		PA			
	4	SS	Fine to coarse sand, trace silt and gravel - gray - dense - moist (Fill - SM - SP)	0.0	21
10.0		PA	Note: Gravel lens at 11.5 ft. Petroleum product odor between 7.5 and 12.0 ft.		
	5	SS		0.0	38
		PA			
	6	SS	medium to coarse sand, trace silt and gravel - brown - dense to very dense - saturated (SP)	0.0	44
15.0		PA			
	7	SS		0.0	50
		PA			
	8	SS		0.0	45
20.0			End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 14.5 ft WS OR WD: WD	BORING STARTED 07/24/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/24/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-9/Deon/KEK	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
POWER/CRSS	B-113
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50
STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - gravel subbase		
	1	SS	Fill: cinders, bricks, wood chips, sand, gravel and clay - brown and black - medium dense to very dense - moist (Rubble fill)	0.0	16
	2	SS		0.0	100
5.0		PA			
	3	SS		3-5	13
		PA			
	4	SS	Medium to coarse sand, trace silt and gravel - black and gray - dense to very dense - moist and saturated (Fill - SP) Note: Strong petroleum odor and staining between 7 and 18 ft.	5-7	14
10.0		PA			
	5	SS		0.2	38
		PA			
	6	SS		2.0	50
15.0		PA			
	7	SS		8.0	55
		PA			
	8	SS		5.0	25/6"
	8A	SS	Fine to medium sand, trace silt and gravel - brownish gray - very dense to extra dense - saturated (SM - SP)		100
20.0		PA			
	9	SS		0.2-1.0	86
22.0			End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 14.5 ft	WS OR WD WS	BORING STARTED 07/24/92	STS OFFICE Northbrook-01
WL BCR	ACR	BORING COMPLETED 07/24/92	ENTERED BY MG — SHEET NO. 1 OF 1
WL		RIG/FOREMAN DR-9/Deon/KEK	APP'D BY DLG — STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
POWER/CRSS	B-114
PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - gravel subbase		
	1	SS	Fill: Cinders, bricks, wood, sand and gravel - brown, black and gray - medium dense - moist (Rubble fill)	0.0	7
	2	SS		0.0	21
5.0	3	SS		0.0	5
		PA			
	4	SS	Fine sand, little cinders, trace silt, gravel and bricks - brown and dark gray - medium dense - moist (Fill - SM)	0.0	15
10.0		PA			
	5	SS	Fine to coarse sand, trace silt and gravel - brownish gray - medium dense to dense - moist to saturated (Fill - SP)	0.0	46
		PA			
	6	SS	Note: Thin gravel lenses.	0.0	63
	6A	SS	Fine to coarse sand, trace silt and gravel - gray - dense - saturated (SM - SP)	0.1	64
15.0		PA			
	7	SS		0.0	34
		PA			
	8	SS		0.0	82
20.0			End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12.5 ft WS OR WD: WS	BORING STARTED 07/27/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/27/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-9/Deon/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	POWER/CRSS
LOG OF BORING NUMBER	B-115
PROJECT NAME	Northwestern Memorial Hospital
ARCHITECT-ENGINEER	Ellerbe Beckett HOK
SITE LOCATION	Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.2 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT) / ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - gravel subbase		
	1	SS	Fill: Cinders, bricks, sand and gravel - brown, black and gray - very loose to medium dense - moist (Rubble fill)	0.0	32
	2	SS		0.0	4
5.0		PA			
	3	SS		0.0	2
		PA			
	4	SS	Fine to medium sand, trace silt and gravel - brown and gray - medium dense to dense - moist and saturated (Fill - SM)	30.4	5
10.0		PA			
	5	SS	Note: Strong odor between 7.5 and 9 ft. Sample S-4 and S-5 retained for chemical testing.	20.9	19
		PA			
	6	SS		20.9	29
15.0		PA			
	7	SS		30.2	25
		PA			
20.0	8	SS		8.0	35
			End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13 ft WS OR WD WS	BORING STARTED 07/27/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/27/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL 15 ft AB	RIG/FOREMAN DR-9/Jack/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT: POWER/CRSS

LOG OF BORING NUMBER: B-116

PROJECT NAME: Northwestern Memorial Hospital

ARCHITECT-ENGINEER: Ellerbe Beckett HOK

SITE LOCATION: Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt, limestone - gravel subbase		
	1	SS	Fill: Bricks, cinders, wood, sand, gravel and miscellaneous debris - brown and dark gray - loose to very dense - moist (Rubble fill)	0.0	26
	2	SS		0.0	11
5.0		PA			
	3	SS		0.0	4
		PA			
	4	SS		0.6	24
10.0		PA			
	5	SS	Fine to medium sand, trace silt and gravel - brownish gray - very dense - moist to saturated (Fill - SM)	0.0	135
		PA			
	6	SS		0.0	54
15.0		PA			
	7	SS		0.0	65
		PA			
	8	SS		0.0	56
20.0			End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12.5 ft; WS OR WD: WS	BORING STARTED 07/27/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/27/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL 12.5 ft AB	RIG/FOREMAN DR-9/Deon/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
POWER/CRSS	B-117
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett HOK

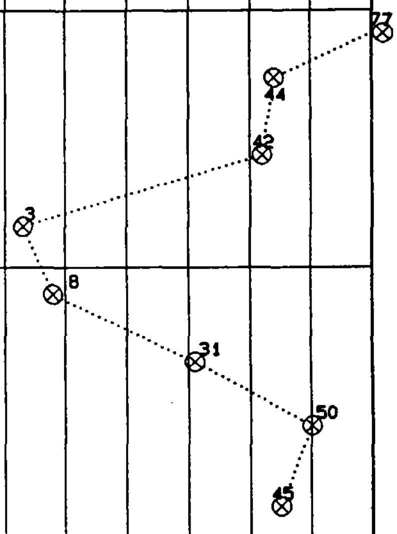
SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)
						SURFACE ELEVATION	
			PA			Asphalt - limestone gravel subbase	
		1	SS			Fill: Cinders, bricks, sand, gravel and wood - brown and dark gray - medium dense - moist (Rubble fill)	0.0
		2	SS				0.0
5.0			PA				
		3	SS				0.0
			PA				
		4	SS				0.0
10.0			PA				
		5	SS			Fine to medium sand, trace silt and gravel - brownish gray - medium dense to dense - moist and saturated (Fill - SM)	0.0
			PA				
		6	SS			Note: Sewer odor at 15 ft.	0.0
15.0			PA				
		7	SS				0.0
			PA				
		8	SS				0.0
20.0						End of Boring Borehole grouted upon completion.	



The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 11.5 ft	WS OR WD WS	BORING STARTED 07/27/92	STS OFFICE Northbrook-01	
WL BCR	ACR	BORING COMPLETED 07/27/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL		RIG/FOREMAN DR-9/Deon/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT: POWER/CRSS	LOG OF BORING NUMBER: B-118
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett HOK

SITE LOCATION: Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/FT. (10 20 30 40 50)

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - gravel subbase		
	1	SS	Fill: Cinders, bricks, sand, gravel, wood and miscellaneous debris - brown and dark gray - medium dense (Rubble fill)	0.0	22
	2	SS	Note: Sample S-5 and S-5A retained for chemical testing.	0.0	18
5.0		PA			
	3	SS		0.0	20
		PA			
	4	SS		0.0	15
10.0		PA			
	5	SS		0.0	13
	5A	SS	Fine to medium sand, trace silt and gravel - brownish gray - dense to very dense - saturated (Fill - SM)		44
		PA			
	6	SS		0.0	31
15.0		PA			
	7	SS		0.0	78
		PA			
	8	SS		0.0	55
20.0			End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 11 ft WS OR WD	BORING STARTED 07/27/92	STS OFFICE Northbrook-01
WL BCR ACR	BORING COMPLETED 07/27/92	ENTERED BY MG — SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-9/Deon/Dumas	APP'D BY DLG — STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT: POWER/CRSS	LOG OF BORING NUMBER: B-119
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - limestone gravel		
	1	SS	Fill: Cinders, brick, sand, gravel, wood and stone - brown and dark gray - medium dense to very loose - moist (Rubble fill)	0.0	25
		PA	Note: Encountered concrete at 2.75 ft., offset boring 3.5 ft. South and 1.0 ft. East.		
5.0	2	SS		0.8	3/6
	2A	SS	Clayey, silty sand, trace gravel - black - loose - moist (Fill)		6
		PA			
	3	SS	Note: Slightly organic odor.	5.0	15
10.0		PA	Fill: Cinders, bricks, sand, gravel, wood and stone - brown and dark gray - medium dense - moist (Rubble fill)		
	4	SS		0.0	32
		PA	Fine to medium sand, trace silt and gravel - light brown and gray - medium dense to dense - moist and saturated (Fill - SM)		
	5	SS		0.0	30
15.0		PA			
	6	SS			39
		PA			
20.0	7	SS			27

End of Boring
Borehole grouted upon completion.

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13 ft	WS OR WD: WS	BORING STARTED: 07/27/92	STS OFFICE: Northbrook-01	
WL BCR	ACR	BORING COMPLETED: 07/27/92	ENTERED BY: MG	SHEET NO. 1 OF 1
WL		RIG/FOREMAN: DR-9/Jack/Mike	APP'D BY: DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
POWER/CRSS	B-120
PROJECT NAME	**ARCHITECT-ENGINEER**
Northwestern Memorial Hospital	Ellerbe Beckett HOK

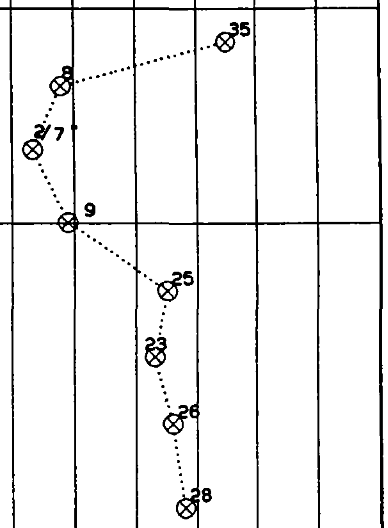
SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)
			SURFACE ELEVATION	
		PA	Asphalt - limestone gravel subbase	
	1	SS	Fill: Cinders, bricks, sand, gravel and decayed wood - brown, black and gray - medium dense to very loose (Rubble fill)	0.0
	2	SS		0.0
5.0		PA		
	3	SS		0.0
		PA		
	4	SS		2.8
			Fine sand, little silt, trace gravel - brown and gray - medium dense - moist to saturated (Fill - SM)	
10.0		PA		
	5	SS		0.5
		PA		
	6	SS		4.9
15.0		PA		
	7	SS		0.0
		PA		
	8	SS		0.0
20.0			End of Boring Borehole grouted upon completion.	



The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13 ft — WS OR WD: WS	BORING STARTED 07/28/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/28/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL 13 ft AB	RIG/FOREMAN DR-9/Mike/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT POWER/CRSS	LOG OF BORING NUMBER B-121
	PROJECT NAME Northwestern Memorial Hospital	ARCHITECT-ENGINEER Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

SURFACE ELEVATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1, 2, 3, 4, 5)
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10, 20, 30, 40, 50)
STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - limestone gravel subbase		
	1	SS	Fill: bricks, wood, cinders, sand and gravel - brown and black - loose (Rubble fill)	0.0	10
	2	SS		0.0	3
5.0		PA			
	3	SS		0.0	3
	3A	SS	Fine sand, trace silt and gravel - brownish gray - medium dense - moist to saturated (Fill - SM)	0.0	2/6"
		PA			
	4	SS		0.0	24
10.0		PA			
	5	SS		0.0	18
		PA			
	6	SS		0.0	12/6"
	6A	SS	Fine to medium sand, trace silt and gravel - gray - medium dense - saturated (SM)	0.0	29
15.0		PA			
	7	SS		0.0	29
		PA			
	8	SS		0.0	39
20.0			End of Boring Borehole grouted upon completion.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13 ft / WS OR WD: WS	BORING STARTED 07/28/92	STS OFFICE Northbrook-01	
WL BCR / ACR	BORING COMPLETED 07/28/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-9/Mike/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT: POWER/CRSS	LOG OF BORING NUMBER: B-122
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
			SURFACE ELEVATION		
		PA	Asphalt - limestone gravel subbase		
	1	SS	Fill: Cinders, bricks, wood, sand, gravel and stone fragments - brown and gray - medium dense (Rubble fill)	0.0	20
	2	SS		0.0	12
5.0		PA			
	3	SS		50.9	24
		PA	Fine sand, trace silt and gravel - gray - medium dense - moist to saturated (Fill - SM)		
	4	SS		80.2	30
10.0		PA	Note: Strong petroleum odor between 7.5 and 13 ft.		
	5	SS		130.4	26
		PA			
	6	SS		20.2	33
15.0		PA			
	7	SS	Fine sand, trace silt and gravel - brownish gray - medium dense to dense - saturated (SM)	2.0	60
		PA			
	8	SS		1.2	57
20.0			End of Boring Borehole grouted upon completion.		

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50
STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12.5 ft	WS OR WD: WS	BORING STARTED: 07/28/92	STS OFFICE: Northbrook-01	
WL BCR	ACR	BORING COMPLETED: 07/28/92	ENTERED BY: MG	SHEET NO. 1 OF 1
WL		RIG/FOREMAN: DR-9/Mike/Dumas	APP'D BY: DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT: POWER/CRSS	LOG OF BORING NUMBER: B-123
PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett HOK
SITE LOCATION: Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois	

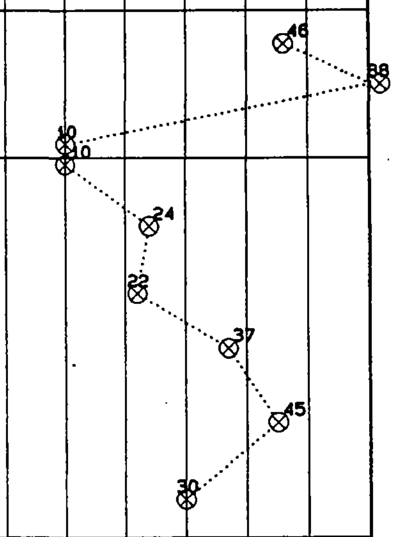
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - limestone gravel subbase		
	1	SS	Fill: Cinders, weathered limestone fragments, bricks, sand, gravel and wood - brown, black and gray - medium dense to very dense (Rubble fill)	0.0	46
	2	SS		0.0	88
5.0		PA			
	3	SS		1.8	10
	3A	SS	Fine sand, little silt, trace gravel - gray to brownish gray - medium dense to dense - moist to saturated (Fill - SM)		10
		PA			
	4	SS		1.8	24
10.0		PA			
	5	SS		0.4	22
		PA			
	6	SS		0.1	37
15.0		PA			
	7	SS		0.0	45
		PA			
	8	SS		0.0	30
20.0			End of Boring Borehole grouted upon completion.		

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50



The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12 ft — WS OR WD: WS	BORING STARTED 07/28/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 07/28/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-9/Mike/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

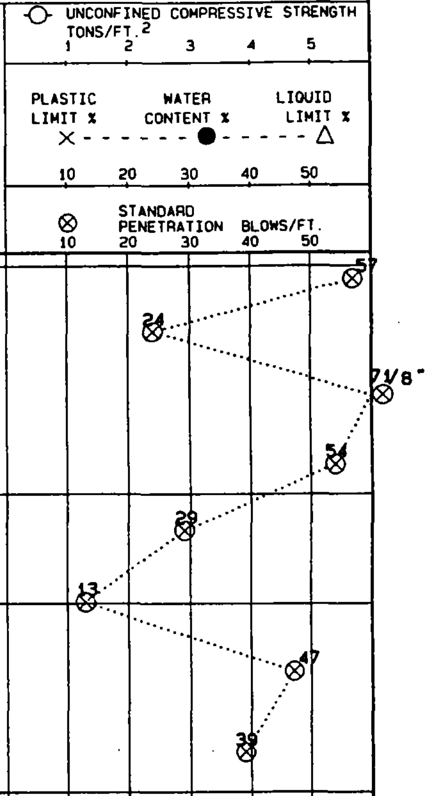
STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
POWER/CRSS	B-124
PROJECT NAME	**ARCHITECT-ENGINEER**
Northwestern Memorial Hospital	Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL
		PA	Asphalt - limestone gravel subbase
	1	SS	Fill: cinders, bricks, stone fragments, sand, gravel and wood - brown and gray - dense to very dense (Rubble fill)
		PA	
	2	SS	
		PA	
5.0	3	SS	
		RB	
	4	SS	
10.0		RB	Fine and medium sand, trace silt and gravel - brownish gray - medium dense - moist (Fill - SM)
	5	SS	
		RB	
	6	SS	Fine sand - brown - dense - saturated (SM)
15.0		RB	
	7	SS	
		RB	
20.0	8	SS	End of Boring Borehole backfilled upon completion



The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL WS OR WD	BORING STARTED 08/06/92	STS OFFICE Northbrook-01	
WL 13 ft BCR ACR	BORING COMPLETED 08/06/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-2/Dumas/Phil	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	POWER/CRSS
LOG OF BORING NUMBER	B-125
PROJECT NAME	Northwestern Memorial Hospital
ARCHITECT-ENGINEER	Ellerbe Beckett HOK
SITE LOCATION	Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT.
			PA	Asphalt - limestone gravel subbase	
		1	SS	Fill: cinders, bricks, sand, gravel and wood - brown, black and gray - loose to medium dense - moist (Rubble fill)	40
			PA		
		2	SS		17
			PA		
5.0		3	SS		9
			PA		
		4	SS		4
10.0			PA		
		5	SS	Fine sand, trace silt and gravel - brownish gray - dense - moist (Fill - SM)	33
			PA		
		6	SS		46
15.0			PA	Fine to medium sand, trace silt and gravel - gray - medium dense to dense - saturated (SM)	
		7	SS		37
			PA		
		8	SS		59
20.0			RB		
		9	SS		41
			RB		
25.0		10	SS		26
			RB	Silty clay, trace gravel and sand - gray - medium - saturated (CL)	
30.0		11	ST		
			RB		
35.0		12	ST		
			RB		
40.0					

... continued

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
POWER/CRSS	B-125
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
						SURFACE ELEVATION
						Continued from previous page
40.0		13	ST			Silty clay, trace gravel and sand - gray - medium - saturated (CL)
			RB			
45.0		14	ST			
			RB			
		15	ST			
50.0						End of Boring Borehole grouted upon completion

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13 ft WS OR WD WS	BORING STARTED 08/06/92	STS OFFICE Northbrook-01	
WL 10 ft BCR ACR	BORING COMPLETED 08/06/92	ENTERED BY MG	SHEET NO. 2 OF 2
WL	RIG/FOREMAN DR-2/Dumas/Phil	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT: POWER/CRSS	LOG OF BORING NUMBER: B-126
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} — 1 2 3 4 5

PLASTIC LIMIT % × - - - - WATER CONTENT % ● - - - - LIQUID LIMIT % △ — 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/FT. — 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT.
		PA	Asphalt - limestone gravel subbase	
	1	SS	Fill: cinders, bricks, sand, gravel and stone fragments - brown, black and gray - very loose to dense - moist (Rubble fill)	33
	2	SS		14
5.0		PA		
	3	SS		3
		PA		
	4	SS	Medium to coarse sand, trace gravel - brown - medium dense - moist (Fill - SP)	24
10.0		PA		
	5	SS		39
		PA		
	6	SS	Fine to medium sand, trace silt and gravel - brown - medium dense to extremely dense - saturated (SW)	50
15.0		PA		
	7	SS		88
		PA		
	8	SS		57
20.0			End of Boring Borehole backfilled upon completion	

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 13 ft — WS OR WD: WS	BORING STARTED: 08/06/92	STS OFFICE: Northbrook-01
WL — BCR — ACR	BORING COMPLETED: 08/06/92	ENTERED BY: MG — SHEET NO. 1 OF 1
WL 17.5 ft AB	RIG/FOREMAN: DR-2/Dumas/Phil	APP'D BY: DLG — STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT POWER/CRSS	LOG OF BORING NUMBER B-127
	PROJECT NAME Northwestern Memorial Hospital	ARCHITECT-ENGINEER Ellerbe Beckett HOK

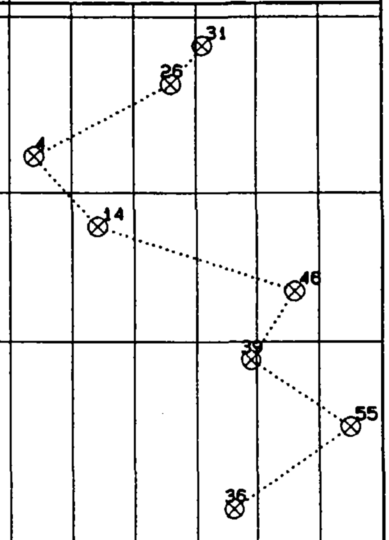
SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL SURFACE ELEVATION
			PA			Asphalt - limestone gravel
		1	SS			Fill: cinders, fine sand, gravel, clay and bricks - loose to dense - moist (Rubble fill)
		2	SS			
5.0			PA			
		3	SS			
			PA			
		4	SS			Fine sand, trace silt and gravel - brown - medium dense to dense - moist (Fill - SM)
10.0			PA			
		5	SS			
			PA			
		6	SS			Fine to medium sand, trace silt and gravel - brown - dense to very dense - saturated (SM-SW)
15.0			PA			
		7	SS			
			PA			
20.0		8	SS			
						End of Boring Borehole backfilled upon completion



The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12 ft — WS OR WD: WD	BORING STARTED 08/06/92	STS OFFICE Northbrook-01	
WL — BCR — ACR	BORING COMPLETED 08/06/92	ENTERED BY MG	SHEET NO. 1 OF 1
WL 14 ft AB	RIG/FOREMAN DR-2/Dumas/Phil	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.	CLIENT: Power/CRSS	LOG OF BORING NUMBER: B-128
	PROJECT NAME: Northwestern Memorial Hospital	ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL SURFACE ELEVATION	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
			PA			Asphalt - limestone gravel subbase		
		1	SS			Rubble fill: Bricks, wood, sand, gravel, cinders, stone fragments - brown and gray - loose to medium dense - moist	<1	12
		2	SS				<1	10
5.0			PA					
		3	SS				<1	7
			PA					
		4	SS				<1	6/6"
		4A	SS			Fill: Fine sand, trace silt and gravel - brown - loose - moist to wet (SM)	<1	6
10.0			PA					
		5	SS				<1	30
			PA			Fine sand, trace silt and gravel - brown - dense - saturated (SM-SW)		
		6	SS				<1	33
14.5						End of Boring		
						Monitoring well installed per enclosed well installation diagram.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12 ft	WS OR WD: WS	BORING STARTED: 09/05/92	STS OFFICE: Northbrook-01	
WL BCR	ACR	BORING COMPLETED: 09/05/92	ENTERED BY: KKB	SHEET NO. 1 OF 1
WL		RIG/FOREMAN: DR-9/Dumas	APP'D BY: DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT: Power/CRSS

LOG OF BORING NUMBER: B-129

PROJECT NAME: Northwestern Memorial Hospital

ARCHITECT-ENGINEER: Ellerbe Beckett/HOK

SITE LOCATION: Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
				SURFACE ELEVATION		
			PA	Asphalt - limestone gravel subbase		
		1	SS, SS	Rubble fill: Bricks, stone fragments, sand, gravel, wood and cinders - brown and gray - loose - moist	<1	11
			PA	Note: Concrete obstruction at 3.0 ft.		
5.0		2	SS		<1	4
			PA	Fill: Fine to medium sand, trace silt and gravel - gray - very loose to loose - moist to wet (SM)		
		3	SS		<1	6
10.0			PA			
		4	SS		<1	17
		5	SS	Fine sand, trace silt and gravel - brown - loose to medium dense - saturated (SW-SM)	<1	
14.5				End of Boring		
				Monitoring well installed per enclosed monitoring well installation diagram.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12 ft, WS OR WD: WS	BORING STARTED 09/05/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 09/05/92	ENTERED BY KKB	SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-9/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

CLIENT	LOG OF BORING NUMBER
Power/CRSS	B-130
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett/HOK

STS Consultants Ltd.

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
			PA	Asphalt - crushed limestone gravel subbase		
		1	SS	Rubble fill: bricks, cinders, sand, gravel, stone fragments, wood and coal - brown, black and gray - loose to medium dense - moist	<1	8
		2	SS		<1	6
		2A	SS		<1	8
5.0			PA			
		3	SS		<1	6
		3A	SS	Fill: Fine sand, trace silt and gravel - brown - medium dense - moist to wet (SM)	<1	22
			PA			
		4	SS		<1	22
10.0			PA			
		5	SS		<1	26
			PA			
		6	SS	Fine sand, trace silt and gravel - black and gray - medium dense - saturated (SM)	190	24
15.0			PA	Note: Strong petroleum product odor and staining.		
		7	SS		25	45
17.0				End of Boring Monitoring well installed per enclosed well installation diagram.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12 ft — WS OR WD: WS	BORING STARTED 09/05/92	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 09/05/92	ENTERED BY KKB	SHEET NO. 1 OF 1
WL	RIG/FOREMAN DR-9/Dumas	APP'D BY DLG	STS JOB NO. 27313-XH

STS Consultants Ltd.

CLIENT	LOG OF BORING NUMBER
Power/CRSS	B-131
PROJECT NAME	ARCHITECT-ENGINEER
Northwestern Memorial Hospital	Ellerbe Beckett/HOK

SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	PHOTO-IONIZATION DETECTOR READING (PPM)	STANDARD PENETRATION BLOWS/FT.
		PA			
	1	SS	Asphalt - limestone gravel subbase	<1	15/6"
	1A	SS	Rubble fill: Bricks, cinders, stone fragments, sand, gravel and wood - brown, black and gray - medium dense to dense - moist	<1	40
	2	SS		<1	17
5.0		PA	Note: Sand lenses at 5.0 ft.		
	3	SS		<1	3/6"
	3A	SS		<1	7
		PA			
	4	SS	Fill: Fine sand - brown and gray - medium dense - moist to wet (SM)	<1	14
10.0		PA			
	5	SS		<1	22
		PA			
	6	SS	Fine sand, trace silt and gravel - brown - medium dense - saturated (SM-SW)	<1	
15.0		PA			
	7	SS		<1	32
17.0			End of Boring		
			Monitoring well installed per enclosed well installation diagram.		

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

WL 12.5 ft	WS OR WD: WS	BORING STARTED: 09/05/92	STS OFFICE: Northbrook-01	
WL BCR	ACR	BORING COMPLETED: 09/05/92	ENTERED BY: KKB	SHEET NO. 1 OF 1
WL		RIG/FOREMAN: DR-9/Dumas	APP'D BY: DLG	STS JOB NO. 27313-XH

STS Construction Services Group
Test Pit Field Record

Project CRSS/NWMH Site Assessment — STS Project No. 27313-XH

Location TP-1 (South Central Area of Super lot) — Date 7/20/92

Weather Ptly Sunny 70°

Time Started 8:10

Time Completed 8:25

Ground Elevation —

EXCAVATION EQUIPMENT

contractor Lindahl — make

operator — model

capacity c.y. — reach 10' ± ft.

DEPTH	QP	Soil Description	water cont.	excav. effort	boulder count Qty. Cl.	remark no. HNu
0–1'		Asphalt - limestone gravel subbase	D	M-E		∅
1'–3'		Cinder fill - sand, gravel, bricks, steel debris, pottery	D	E		
3'–6'		Rubble - Cinder fill - bricks, cinders, sand, gravel, charred wood, coal Large steel sheet pile wall at 3.5'	D	E		∅
6'–8'		F-M Sand fill, Tan-gray	M	E		
8'		End of Test pit				
9'						
10'						
11'						
12'						
13'						
14'						

REMARKS:

QP = Calibrated Penetronometer (tons/ft²)

PROPORTIONS USED	
trace(tr.)	0-10%
little(lt.)	10-20%
some(so.)	20-35%
and	35-50%

ABBREV.
- F—Fine
- M—Medium
- C—Course
- V—Very
- Gr.—Gray
- Bn.—Brown
- Yel.—Yellow

EXCAVATION EFFORT
- E—Easy
- M—Moderate
- D—Difficult

GROUNDWATER
Elapsed time to reading (hrs.) — G.W.L.

STS Construction Services Group
Test Pit Field Record

Project: CRSS / NWMH Site Assessment   STS Project No. 27313-XH

Location: TP-2 (NE-Central area of West Superlot)   Date: 7/20/92

Weather: Ptly Cloudy 70°   EXCAVATION EQUIPMENT

Time Started: 8:50   contractor: Lindahl   make:

Time Completed: 9:10   operator: model:

Ground Elevation: —   capacity: c.y.   reach: ft.

DEPTH	QP	Soil Description	water cont.	excav. effort	boulder count Qty. Cl.	remark no.
0 – 1'		Asphalt – Limestone gravel subbase	D	M-E		
2' – 9'		Rubble fill - Cinders, bricks, sand, gravel, misc refuse and debris, coal. Large clump of steel scrap encountered in excavation	D (6'), D (8')	E (2'), M-E (6'), E (9')		Ø
10'		F-M Sand fill, Tan-gray	M	E		Ø
11'		End of Test pit				
12'						
13'						
14'						

REMARKS:

QP = Calibrated Penetronometer (tons/ft²)

PROPORTIONS USED		ABBREV.	EXCAVATION EFFORT
trace(tr.)	0-10%	F—Fine	E—Easy
little(lt.)	10-20%	M—Medium	M—Moderate
some(so.)	20-35%	C—Course	D—Difficult
and	35-50%	V—Very	GROUNDWATER
		Gr.—Gray	Elapsed time to reading (hrs.)
		Bn.—Brown	G.W.L.
		Yel.—Yellow	

STS Construction Services Group
Test Pit Field Record

Project CRSS/NWMH Site Assessment STS Project No. 27313-XH

Location TP-3 (NEC of Superlot) Date 7/20/92

Weather mostly sunny, 70°

Time Started 9:38 am

Time Completed 9:50 am

Ground Elevation —

EXCAVATION EQUIPMENT

contractor Lindahl make

operator model

capacity c.y. reach 10 ft.

DEPTH	QP	Soil Description	water cont.	excav. effort	boulder count Qty. Cl.	remark no. HNu
0	N/A	Asphalt - Ls gravel subbase	Dry	M		∅
1'–6'		Rubble fill Bricks, wood, sand, gravel, steel debris, cinders, limestone gravel. Lense of fused limestone gravel at 5ft. Numerous cylindrical objects (possible castings)	Dry	E E		∅
6'–7'		Peat / Black Peat	moist			
7'–10'		Fine to medium sand fill, Tan-gray	moist	E		∅
10'		End of Test Pit				
11'						
12'						
13'						
14'						

REMARKS:

QP = Calibrated Penetronometer (tons/ft²)

PROPORTIONS USED

trace(tr.)	0-10%
little(lt.)	10-20%
some(so.)	20-35%
and	35-50%

ABBREV.

F—Fine
M—Medium
C—Course
V—Very
Gr.—Gray
Bn.—Brown
Yel.—Yellow

EXCAVATION EFFORT

E—Easy
M—Moderate
D—Difficult

GROUNDWATER

Elapsed time to reading (hrs.) G.W.L.

STS Construction Services Group
Test Pit Field Record

Project CRSS/NWMH Site Assessment STS Project No. 27313-XH

Location TP-4 (SWC of Middle Lot) Date 7/20/92

Weather Cloudy, humid, 70°

Time Started 11:00

Time Completed 11:15

Ground Elevation —

EXCAVATION EQUIPMENT

contractor Lindahl make

operator model

capacity c.y. reach ft.

DEPTH	QP	Soil Description	water cont.	excav. effort	boulder count Qty. Cl.	remark no. HNu
0–1'		Asphalt and limestone gravel subbase (2 layers)	D	M-E		Ø
1'–5'		Rubble-Cinder fill - Cinders, Bricks, sand, gravel, bottles, wood, roofing shingles and tar (odor), Alternating layers	D D D	E		10
5'–7'		F+M Sand fill, gray	M	I		
8'		End of Test Pit				
9'–14'		Note: Difficult access to pit location due to densely parked cars				

REMARKS:

QP = Calibrated Penetronometer (tons/ft^2)

PROPORTIONS USED	
trace(tr.)	0-10%
little(lt.)	10-20%
some(so.)	20-35%
and	35-50%

ABBREV.

F—Fine
M—Medium
C—Course
V—Very
Gr.—Gray
Bn.—Brown
Yel.—Yellow

EXCAVATION EFFORT

E—Easy
M—Moderate
D—Difficult

GROUNDWATER

Elapsed time to reading (hrs.) G.W.L.

STS Construction Services Group
Test Pit Field Record

Project CRSS/NWMH Site Assessment STS Project No. 27813-XH

Location TP-5 (NNW of Kraft Bldg) Date 7/20/92

Weather Cloudy, humid 70°

Time Started 11:45

Time Completed 12:10

Ground Elevation —

EXCAVATION EQUIPMENT

contractor Lindahl make

operator model

capacity c.y. reach ft.

DEPTH	QP	Soil Description (North — South)	water cont.	excav. effort	boulder count Qty. Cl.	remark no. (HNu)
0–2'	N/A	Asphalt (3") and crushed limestone subbase	Dry	M E		Ø
2'–7'		Rubble fill – Bricks glass, cinders, wood, peat, sand, gravel, roots, clay pipe, misc. refuse. Concrete Structure (Possible Sewer)	Dry- MOIST	E D		Ø
7'–9'		F-M sand Fill, gray-tan	MOIST	D-E		Ø
9'		End of Test Pit				

Depth scale: 0, 1', 2', 3', 4', 5', 6', 7', 8', 9', 10', 11', 12', 13', 14'

REMARKS:

QP = Calibrated Penetronometer (tons/ft²)

PROPORTIONS USED

trace(tr.)	0-10%
little(lt.)	10-20%
some(so.)	20-35%
and	35-50%

ABBREV.

F—Fine
M—Medium
C—Course
V—Very
Gr.—Gray
Bn.—Brown
Yel.—Yellow

EXCAVATION EFFORT

E—Easy
M—Moderate
D—Difficult

GROUNDWATER

Elapsed time to reading (hrs.) G.W.L.

STS Construction Services Group
Test Pit Field Record

Project CRSS/NWMH Site Assessment — STS Project No. 27313-XH

Location TP-6 (NWC of East Lot) — Date 7/20/92

Weather Cloudy, light rain

Time Started 12:35

Time Completed 12:55

Ground Elevation —

EXCAVATION EQUIPMENT

contractor Lindahl — make

operator — model

capacity c.y. — reach ft.

DEPTH	QP	Soil Description	water cont.	excav. effort	boulder count Qty. Cl.	remark no. HNu
0		Asphalt - Limestone subbase	D	M-E		Ø
1'	N/A	Black rubble fill cinders	D			
2'		Silty-Clay fill, greenish gray, mottled, slightly organic, tr sa, gr, shale, rubble fill	D-M	E		Ø
3'						
4'						
5'		Rubble fill - wood, glass, bricks, metallic scrap, burn debris, charcol, sand, gravel	D	E		Ø
6'						
7'						
8'		F-M Sand fill, tan-gray	M	E		Ø
9'		End of Test pit				
10'						
11'						
12'						
13'						
14'						

REMARKS:

QP = Calibrated Penetronometer (tons/ft²)

PROPORTIONS USED	
trace(tr.)	0-10%
little(lt.)	10-20%
some(so.)	20-35%
and	35-50%

ABBREV.
F—Fine
M—Medium
C—Course
V—Very
Gr.—Gray
Bn.—Brown
Yel.—Yellow

EXCAVATION EFFORT
E—Easy
M—Moderate
D—Difficult

GROUNDWATER
Elapsed (hrs.) time to reading — G.W.L.

STS Construction Services Group
Test Pit Field Record

Project CRSS/NWMH Site Assessment STS Project No. 27313-XH

Location TP-7 (North Central area of Superlot) Date 7/20/92

Weather Pt/y Cloudy, 70°

Time Started 1:45

Time Completed 2:10

Ground Elevation

EXCAVATION EQUIPMENT

contractor Lindahl make

operator model

capacity c.y. reach ft.

DEPTH	QP	Soil Description	water cont.	excav. effort	boulder count Qty. Cl.	remark no. HNu
0 – 1′	N/A	Asphalt-Gravel Subbase	D	M-E		∅
1′ – 2′		Gravel Fill, DK gray-brown	D			
2′ – 7′		Rubble fill - bricks, large stone and concrete blocks, asphalt, sand, gravel, wood, Misc. refuse, debris	D	M-E		∅
			D			
		Note: Bottom wet from sewer seepage	wet	E		∅
7′ – 8′		Concrete Slab (basement floor)		D		
		End of test pit (refusal)				
9′ – 14′						

REMARKS:

QP = Calibrated Penetronometer (tons/ft^2)

PROPORTIONS USED

trace(tr.)	0-10%
little(lt.)	10-20%
some(so.)	20-35%
and	35-50%

ABBREV.

F—Fine
M—Medium
C—Course
V—Very
Gr.—Gray
Bn.—Brown
Yel.—Yellow

EXCAVATION EFFORT

E—Easy
M—Moderate
D—Difficult

GROUNDWATER

Elapsed time to reading (hrs.) G.W.L.

STS CONSULTANTS, LTD.

DRILLING & SAMPLING SYMBOLS:

SS : Split Spoon-1 3/8" I.D., 2" O.D. Unless otherwise noted
ST : Shelby Tube-2" O.D., Unless otherwise noted
PA : Power Auger
DB : Diamond Bit-NX, BX, AX
AS : Auger Sample
JS : Jar Sample
VS : Vane Shear
OS : Osterberg Sampler-3" Shelby Tube
HS : Hollow Stem Auger
WS : Wash Sample
FT : Fish Tail
RB : Rock Bit
BS : Bulk Sample
PM : Pressuremeter Test, In-Situ
GS : Giddings Sampler

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon sampler, except where otherwise noted.

WATER LEVEL MEASUREMENT SYMBOLS:

WL : Water Level
WS : While Sampling
WD : While Drilling
AB : After Boring
WCI : Wet Cave In
DCI : Dry Cave In
BCR : Before Casing Removal
ACR : After Casing Removal

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable groundwater levels. In impervious soils, the accurate determination of groundwater elevations may not be possible, even after several days of observations; additional evidence of groundwater elevations must be sought.

GRADATION DESCRIPTION & TERMINOLOGY:

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

Major Component Of Sample	Size Range
Boulders	Over 8 in. (200 mm)
Cobbles	8 inches to 3 inches (200 mm to 75 mm)
Gravel	3 inches to #4 sieve (75 mm to 4.76 mm)
Sand	#4 to #200 sieve (4.76 mm to 0.074 mm)
Silt	Passing #200 sieve (0.074 mm to 0.005 mm)
Clay	Smaller than 0.005 mm

Description Of Components Also Present in Sample	Percent Of Dry Weight
Trace	1-9
Little	10-19
Some	20-34
And	35-50

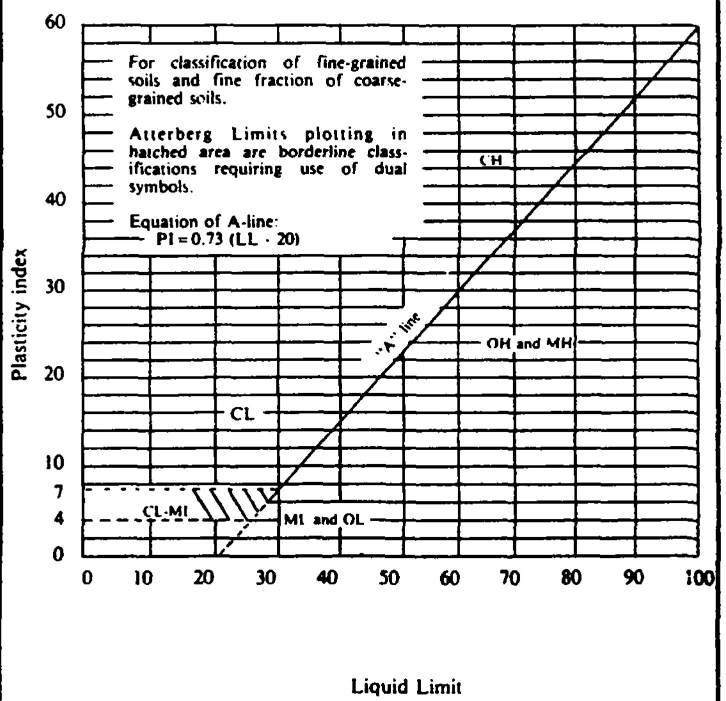
CONSISTENCY OF COHESIVE SOILS:

Unconfined Compressive Strength, Qu, tsf	Consistency
0.25	Very Soft
0.25-0.49	Soft
0.50-0.99	Medium (Firm)
1.00-1.99	Stiff
2.00-3.99	Very Stiff
4.00-8.00	Hard
>8.00	Very Hard

RELATIVE DENSITY OF GRANULAR SOILS:

N-Blows per ft.	Relative Density
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80	Very Dense
>80	Extremely Dense

UNIFIED SOIL CLASSIFICATION

Major Divisions			Group symbols	Typical names	Laboratory classification criteria		
Coarse-grained soils (More than half of material is *larger* than No. 200 sieve size)	Gravels (More than half of coarse fraction larger than No. 4 sieve size)	Clean gravels (Little of no fines)	GW	Well-grades gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 per cent .... GW, GP, SW, SP; More than 12 per cent .... GM, GC, SM, SC; *5 to 12 per cent* .... *Borderline* cases requiring dual symbols	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} x D_{60}}$ between 1 and 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM d u	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} x D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM d u	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half of material is *smaller* than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity			
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		Pt	Peat and other highly organic soils	Plasticity Chart		

SUBSURFACE EXPLORATION PROCEDURES

Hand-Auger Drilling (HA)

In this procedure, a sampling device is driven into the soil by repeated blows of a sledge hammer. When the sampler is driven to the desired sample depth, the soil sample is retrieved. The hole is then advanced by manually turning the hand auger until the next sampling depth increment is reached. The hand auger drilling between sampling intervals also helps to clean and enlarge the bore hole in preparation for obtaining the next sample.

Power Auger Drilling (PA)

In this type of drilling procedure, continuous flight augers are used to advance the bore holes. They are turned and hydraulically advanced by a truck or track-mounted unit as site accessibility dictates. In auger drilling, casing and drilling mud are not required to maintain open bore holes.

Hollow Stem Auger Drilling (HS)

In this drilling procedure, continuous flight augers having open stems are used to advance the bore holes. The open stem allows the sampling tool to be used without removing the augers from the bore hole. Hollow stem augers thus provide support to the sides of the bore hole during the sampling operations.

Rotary Drilling (RB)

In employing rotary drilling methods, various cutting bits are used to advance the bore holes. In this process, surface casing and/or drilling fluids are used to maintain open bore holes.

Diamond Core Drilling (DB)

Diamond core drilling is used to sample cemented formations. In this procedure, a double tube (triple tube) core barrel with a diamond bit cuts an annular space around a cylindrical prism of the material sampled. The sample is retrieved by a catcher just above the bit. Samples recovered by this procedure are placed in sturdy containers in sequential order.

SAMPLING PROCEDURES

Auger Sampling (AS)

In this procedure, soil samples are collected from cuttings off of the auger flights as they are removed from the ground. Such samples provide a general indication of subsurface conditions; however, they do not provide undisturbed samples, nor do they provide samples from discrete depths.

Split-Barrel Sampling (SS) — (ASTM Standard D-1586-84)

In the split-barrel sampling procedure, a 2 inch O.D., split barrel sampler is driven into the soil a distance of 18 inches by means of a 140 pound hammer falling 30 inches. The value of the Standard Penetration Resistance is obtained by counting the number of blows of the hammer over the final 12 inches of driving. This value provides a qualitative indication of the in-place relative density of cohesionless soils. The indication is qualitative only, however, since many factors can significantly affect the Standard Penetration Resistance Value, and direct correlation of results obtained by drill crews using different rigs, drilling procedures, and hammer-rod-spoon assemblies should not be made. A portion of the recovered sample is placed in a sample jar and returned to the laboratory for further analysis and testing.

Shelby Tube Sampling Procedure (ST) — (ASTM Standard D-1587-83)

In the shelby tube sampling procedure, a thin-walled steel seamless tube with a sharp cutting edge is pushed hydraulically into the soil and a relatively undisturbed sample is obtained. This procedure is generally employed in cohesive soils. The tubes are carefully handled in the field to avoid excessive disturbance and are returned to the laboratory for extrusion and further analysis and testing.

Giddings Sampler (GS)

This type of sampling device consists of 5-ft. sections of thin-wall tubing which are capable of retrieving continuous columns of soil in 5-ft. maximum increments. Because of a continuous slot in the sampling tubes, the sampler allows field determination of stratification boundaries and containerization of soil samples from any sampling depth within the 5-ft. interval.

LABORATORY PROCEDURES

Water Content (Wc)

The water content of a soil is the ratio of the weight of water in a given soil mass to the weight of the dry soil. Water content is generally expressed as a percentage.

Hand Penetrometer (Qp)

In the hand penetrometer test, the unconfined compressive strength of a soil is determined, to a maximum value of 4.5 tons per square foot (tsf), by measuring the resistance of the soil sample to penetration by a small, spring-calibrated cylinder. The hand penetrometer test has been carefully correlated with unconfined compressive strength tests, and thereby provides a useful and a relatively simple testing procedure in which soil strength can be quickly and easily estimated.

Unconfined Compression Tests (Qu)

In the unconfined compression strength test, an undisturbed prism of soil is loaded axially until failure or until 20% strain has been reached, whichever occurs first.

Dry Density (γ_D)

The dry density is the quantity used as a measure of the amount of solids in a unit volume of soil aggregate. Use of this value is often made when measuring the degree of compaction of a soil.

Classification of Samples

In conjunction with the sample testing program, all soil samples are examined in our laboratory and classified on the basis of their texture and plasticity in accordance with United Soil Classification System (USCS). The soil descriptions on the boring logs are in conformance with this system and the estimated group symbols according to this system are included in parentheses following the soil descriptions on the boring logs. Included on a separate sheet entitled "General Notes" is a brief explanation of this system of soil classification.

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In the process of obtaining and testing samples and preparing this report, standard procedures are followed regarding field logs, laboratory data sheets and samples.

Field logs are prepared during performance of the drilling and sampling operations and are intended to essentially portray field occurrences, sampling locations and procedures.

Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory by more experienced soil engineers, and differences between the field logs and the final logs may exist.

The engineer preparing the report reviews the field and laboratory logs, classifications and test data, and using judgment and experience in interpreting this data, may make further changes.

Samples taken in the field, some of which are later subjected to laboratory tests, are retained in our laboratory for sixty days and are then destroyed unless special disposition is requested by our client. Samples retained over a long period of time, even in sealed jars, are subject to moisture loss which changes the apparent strength of cohesive soil, generally increasing the strength from what was originally encountered in the field. Since they are then no longer representative of the moisture conditions initially encountered, observers of these samples should recognize this factor.

It is common practice in the geotechnical engineering profession that field logs and laboratory data sheets not included in engineering reports, because they do not represent the engineer's final opinions as to appropriate descriptions for conditions encountered in the exploration and testing work. On the other hand, we are aware that perhaps certain contractors and subcontractors submitting bids or proposals on work might have an interest in studying these documents before submitting a bid or proposal. For this reason, the field logs are retained in our office for review by all contractors submitting a bid or proposal. We would welcome the opportunity to explain any changes that have been and typically are made in the preparation of our final reports, to the contractor or subcontractors, before the firm submits its bid or proposal, and to describe how the information was obtained to the extent the contractor or subcontractor wishes. Results of laboratory tests are generally shown on the boring logs or are described in the text of the report, as appropriate.

The descriptive terms and symbols used on the logs are described on the attached sheet, entitled: "General Notes".

AMERICAN SOCIETY FOR TESTING AND MATERIALS

Standard Method for
PENETRATION TEST AND SPLIT-BARREL SAMPLING OF SOILS[1]

This standard is issued under the fixed designation D 1586; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of the last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (є) indicates an editorial change since the last revision or reapproval.

This method has been approved for use by agencies of the Department of Defense and for listing in the DOD Index of Specifications and Standards.

1. Scope

1.1 This method describes the procedure, generally known as the Standard Penetration Test (SPT), for driving a split-barrel sampler to obtain a representative soil sample and a measure of the resistance of the soil to penetration of the sampler.

1.2 This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For a specific precautionary statement, see 5.4.1.

1.3 The values stated in inch-pound units are to be regarded as the standard.

2. Applicable Documents

2.1 ASTM Standards:

D2487 Test Method for Classification of Soils for Engineering Purposes[2]

D2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)[2]

D4220 Practice for Preserving and Transporting Soil Samples[2]

3. Descriptions of Terms Specific to This Standard

3.1 anvil—that portion of the drive-weight assembly which the hammer strikes and through which the hammer energy passes into the drill rods.

3.2 cathead—the rotating drum or windlass in the rope-cathead lift system around which the operator wraps a rope to lift and drop the hammer by successively tightening and loosening the rope turns around the drum.

3.3 drill rods—rods used to transmit downward force and torque to the drill bit while drilling a borehole.

3.4 drive-weight assembly—a device consisting of the hammer, hammer fall guide, the anvil, and any hammer drop system.

3.5 hammer—that portion of the drive-weight assembly consisting of the 140 ± 2 lb (63.5 ± 1 kg) impact weight which is successively lifted and dropped to provide the energy that accomplishes the sampling and penetration.

3.6 hammer drop system—that portion of the drive-weight assembly by which the operator accomplishes the lifting and dropping of the hammer to produce the blow.

3.7 hammer fall guide—that part of the drive-weight assembly used to guide the fall of the hammer.

3.8 N-value—the blowcount representation of the penetration resistance of the soil. The N-value, reported in blows per foot, equals the sum of the number of blows required to drive the sampler over the depth interval of 6 to 18 in. (150 to 450 mm) (see 7.3).

3.9 ΔN—the number of blows obtained from each of the 6-in. (150-mm) intervals of sampler penetration (see 7.3).

3.10 number of rope turns—the total contact angle between the rope and the cathead at the beginning of the operator's rope slackening to drop the hammer, divided by 360° (see Fig. 1).

3.11 sampling rods—rods that connect the drive-weight assembly to the sampler. Drill rods are often used for this purpose.

3.12 SPT—abbreviation for Standard Penetration Test, a term by which engineers commonly refer to this method.

4. Significance and Use

4.1 This method provides a soil sample for identification purposes and for laboratory tests appropriate for soil obtained from a sampler that may produce large shear strain disturbance in the sample.

4.2 This method is used extensively in a great variety of geotechnical exploration projects. Many local correlations and widely published correlations which relate SPT blowcount, or N-value, and the engineering behavior of earthworks and foundation are available.

[1] This method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of subcommittee D18.02 on Sampling and Related Field Testing for Soil Investigations.

Current edition approved Sept. 11, 1984. Published November 1984. Originally published as D1586—58T. Last previous edition D1586—67 (1974).

[2] Annual Book of ASTM Standards, Vol 04.08.

5. Apparatus

5.1 Drilling Equipment—Any drilling equipment that provides at the time of sampling a suitably clean open hole before insertion of the sampler and ensures that the penetration test is performed on undisturbed soil shall be acceptable. The following pieces of equipment have proven to be suitable for advancing a borehole in some subsurface conditions.

5.1.1 Drag, Chopping, and Fishtail Bits, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used in conjunction with open-hole rotary drilling or casing-advancement drilling methods. To avoid disturbance of the underlying soil, bottom discharge bits are not permitted; only side discharging bits are permitted.

5.1.2 Roller-Cone Bits, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used in conjunction with open-hole rotary drilling or casing-advancement drilling methods if the drilling fluid discharge is deflected.

5.1.3 Hollow-Stem Continuous Flight Augers, with or without a center bit assembly, may be used to drill the boring. The inside diameter of the hollow-stem augers shall be less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm).

5.1.4 Solid, Continuous Flight, Bucket and Hand Augers, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used if the soil on the side of the boring does not cave onto the sampler or sampling rods during sampling.

5.2 Sampling Rods—Flush-joint steel drill rods shall be used to connect the split-barrel sampler to the drive-weight assembly. The sampling rod shall have a stiffness (moment of inertia) equal to or greater than that of parallel wall "A" rod (a steel rod which has an outside diameter of 1⅝ in. (41.2 mm) and an inside diameter of 1⅛ in. (28.5 mm).

NOTE 1—Recent research and comparative testing indicates the type rod used, with stiffness ranging from "A" size rod to "N" size rod, will usually have a negligible effect on the N-values to depths of at least 100 ft (30 m).

5.3 Split-Barrel Sampler—The sampler shall be constructed with the dimensions indicated in Fig. 2. The driving shoe shall be of hardened steel and shall be replaced or repaired when it becomes dented or distorted. The use of liners to produce a constant inside diameter of 1⅜ in. (35 mm) is permitted, but shall be noted on the penetration record if used. The use of a sample retainer basket is permitted, and should also be noted on the penetration record if used.

NOTE 2—Both theory and available test data suggest that N-values may increase between 10 to 30% when liners are used.

5.4 Drive-Weight Assembly:

5.4.1 Hammer and Anvil—The hammer shall weigh 140 ± 2 lb (63.5 ± 1 kg) and shall be a solid rigid metallic mass. The hammer shall strike the anvil and make steel on steel contact when it is dropped. A hammer fall guide permitting a free fall shall be used. Hammers used with the cathead and rope method shall have an unimpeded overlift capacity of at least 4 in. (100 mm). For safety reasons, the use of a hammer assembly with an internal anvil is encouraged.

NOTE 3—It is suggested that the hammer fall guide be permanently marked to enable the operator or inspector to judge the hammer drop height.

5.4.2 Hammer Drop System—Rope-cathead, trip, semi-automatic, or automatic hammer drop systems may be used, providing the lifting apparatus will not cause penetration of the sampler while re-engaging and lifting the hammer.

5.5 Accessory Equipment—Accessories such as labels, sample containers, data sheets, and groundwater level measuring devices shall be provided in accordance with the requirements of the project and other ASTM standards.

6. Drilling Procedure

6.1 The boring shall be advanced incrementally to permit intermittent or continuous sampling. Test intervals and locations are normally stipulated by the project engineer or geologist. Typically, the intervals selected are 5 ft (1.5 m) or less in homogeneous strata with test and sampling locations at every change of strata.

6.2 Any drilling procedure that provides a suitably clean and stable hole before insertion of the sampler and assures that the penetration test is performed on essentially undisturbed soil shall be acceptable. Each of the following procedures have proven to be acceptable for some subsurface conditions. The subsurface conditions anticipated should be considered when selecting the drilling method to be used.

6.2.1 Open-hole rotary drilling method.

6.2.2 Continuous flight hollow-stem auger method.

6.2.3 Wash boring method.

6.2.4 Continuous flight solid auger method.

6.3 Several drilling methods produce unacceptable borings. The process of jetting through an open tube sampler and then sampling when the desired depth is reached shall not be permitted. The continuous flight solid auger method shall not be used for advancing the boring below a water table or below the upper confining bed of a confined non-cohesive stratum that is under artesian pressure. Casing may not be advanced below the sampling elevation prior to sampling. Advancing a boring with bottom discharge bits is not permissible. It is not permissible to advance the boring for subsequent insertion of the sampler solely by means of previous sampling with the SPT sampler.

6.4 The drilling fluid level within the boring or hollow-stem augers shall be maintained at or above the in situ groundwater level at all times during drilling, removal of drill rods, and sampling.

7. Sampling and Testing Procedure

7.1 After the boring has been advanced to the desired sampling elevation and excessive cuttings have been removed, prepare for the test with the following sequence of operations.

7.1.1 Attach the split-barrel sampler to the sampling rods and lower into borehole. Do not allow the sampler to drop onto the soil to be sampled.

7.1.2 Position the hammer above and attach the anvil to the top of the sampling rods. This may be done before the sampling rods and sampler are lowered into the borehole.

7.1.3 Rest the dead weight of the sampler, rods, anvil, and drive weight on the bottom of the boring and apply a seating blow. If excessive cuttings are encountered at the bottom of the boring, remove the sampler and sampling rods from the boring and remove the cuttings.

7.1.4 Mark the drill rods in three successive 6-in. (0.15-m) increments so that the advance of the sampler under the impact of the hammer can be easily observed for each 6-in. (0.15-m) increment.

7.2 Drive the sampler with blows from the 140-lb (63.5-kg) hammer and count the number of blows applied in each 6-in. (0.15-m) increment until one of the following occurs:

7.2.1 A total of 50 blows have been applied during any one of the three 6-in. (0.15-m) increments described in 7.1.4.

7.2.2 A total of 100 blows have been applied.

7.2.3 There is no observed advance of the sampler during the application of 10 successive blows of the hammer.

7.2.4 The sampler is advanced the complete 18 in. (0.45 m) without the limiting blow counts occurring as described in 7.2.1, 7.2.2, or 7.2.3.

7.3 Record the number of blows required to effect each 6 in. (0.15m) of penetration or fraction thereof. The first 6 in. is considered to be a seating drive. The sum of the number of blows required for the second and third 6 in. of penetration is termed the "standard penetration resistance", or the "N-value". If the sampler is driven less than 18 in. (0.45 m), as permitted in 7.2.1, 7.2.2, or 7.2.3, the number of blows per each complete 6-in. (0.15-m) increment and per each partial increment shall be recorded on the boring log. For partial increments, the depth of penetration shall be reported to the nearest 1 in. (25 mm), in addition to the number of blows. If the sampler advances below the bottom of the boring under the static weight of the drill rods or the weight of the drill rods plus the static weight of the hammer, this information should be noted on the boring log.

7.4 The raising and dropping of the 140-lb (63.5-kg) hammer shall be accomplished using either of the following two methods:

7.4.1 By using a trip, automatic, or semi-automatic hammer drop system which lifts the 140-lb (63.5-kg) hammer and allows it to drop 30 ± 1.0 in. (0.76 m ± 25 mm) unimpeded.

7.4.2 By using a cathead to pull a rope attached to the hammer. When the cathead and rope method is used the system and operation shall conform to the following:

7.4.2.1 The cathead shall be essentially free of rust, oil, or grease and have a diameter in the range of 6 to 10 in. (150 to 250 mm).

7.4.2.2 The cathead should be operated at a minimum speed of rotation of 100 RPM, or the approximate speed of rotation shall be reported on the boring log.

7.4.2.3 No more than 2¼ rope turns on the cathead may be used during the performance of the penetration test, as shown in Fig. 1.

NOTE 4—The operator should generally use either 1¾ of 2¼ rope turns, depending upon whether or not the rope comes off the top (1¾ turns) or the bottom (2¼ turns) of the cathead. It is generally known and accepted that 2¾ or more rope turns considerably impedes the fall of the hammer and should not be used to perform the test. The cathead rope should be maintained in a relatively dry, clean, and unfrayed condition.

7.4.2.4 For each hammer blow, a 30-in. (0.76-m) lift and drop shall be employed by the operator. The operation of pulling and throwing the rope shall be performed rhythmically without holding the rope at the top of the stroke.

7.5 Bring the sampler to the surface and open. Record the percent recovery or length of sample recovered. Describe the soil samples recovered as to composition, color, stratification, and condition, then place one or more representative portions of the sample into sealable moisture-proof containers (jars) without ramming or distorting any apparent stratification. Seal each container to prevent evaporation of soil moisture. Affix labels to the containers bearing job designation, boring number, sample depth, and the blow count per 6-in. (0.15-m) increment. Protect the samples against extreme temperature changes. If there is a soil change within the sampler, make a jar for each stratum and note its location in the sampler barrel.

8. Report

8.1 Drilling information shall be recorded in the field and shall include the following:

8.1.1 Name and location of job,

8.1.2 Names of crew,

8.1.3 Type and make of drilling machine,

8.1.4 Weather conditions,

8.1.5 Date and time of start and finish of boring,

8.1.6 Boring number and location (station and coordinates, if available and applicable),

8.1.7 Surface elevation, if available,

8.1.8 Method of advancing and cleaning the boring,

8.1.9 Method of keeping boring open,

8.1.10 Depth of water surface and drilling depth at the time of a noted loss of drilling fluid, and time and date when reading or notation was made,

8.1.11 Location of strata changes,

8.1.12 Size of casing, depth of cased portion of boring,

8.1.13 Equipment and method of driving sampler,

8.1.14 Type of sampler and length and inside diameter of barrel (note use of liners),

8.1.15 Size, type, and section length of the sampling rods, and

8.1.16 Remarks.

8.2 Data obtained for each sample shall be recorded in the field and shall include the following:

8.2.1 Sample depth and, if utilized, the sample number,

8.2.2 Description of soil,

8.2.3 Strata changes within sample,

8.2.4 Sampler penetration and recovery lengths, and

8.2.5 Number of blows per 6-in. (0.15-m) or partial increment.

9. Precision and Bias

9.1 Variations in N-values of 100% or more have been observed when using different standard penetration test apparatus and drillers for adjacent borings in the same soil formation. Current opinion, based on field experience, indicates that when using the same apparatus and driller, N-values in the same soil can be reproduced with a coefficient of variation of about 10%.

9.2 The use of faulty equipment, such as an extremely massive or damaged anvil, a rusty cathead, a low speed cathead, an old, oily rope, or massive or poorly lubricated rope sheaves can significantly contribute to differences in N-values obtained between operator-drill rig systems.

9.3 The variability in N-values produced by different drill rigs and operators may be reduced by measuring that part of the hammer energy delivered into the drill rods from the sampler and adjusting N on the basis of comparative energies. A method for energy measurement and N-value adjustment is currently under development.

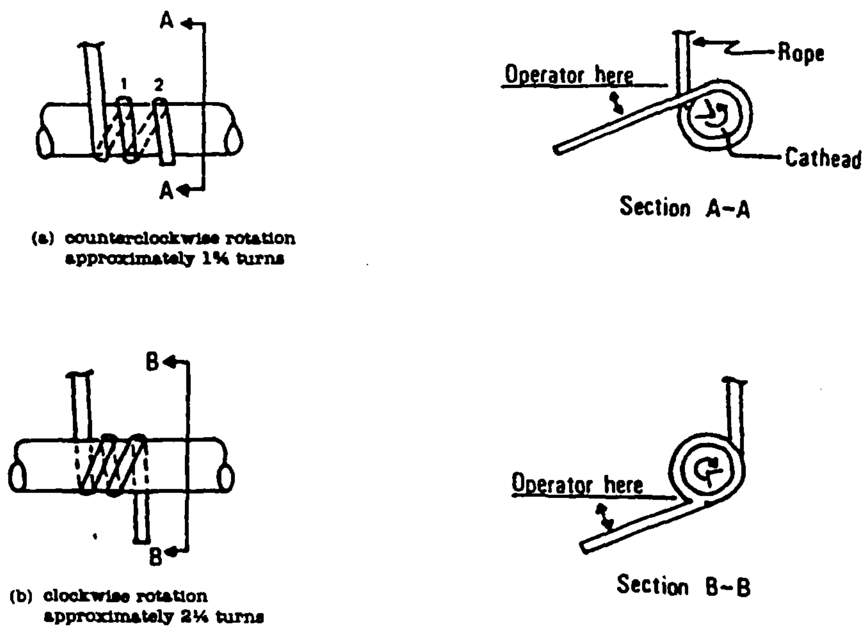
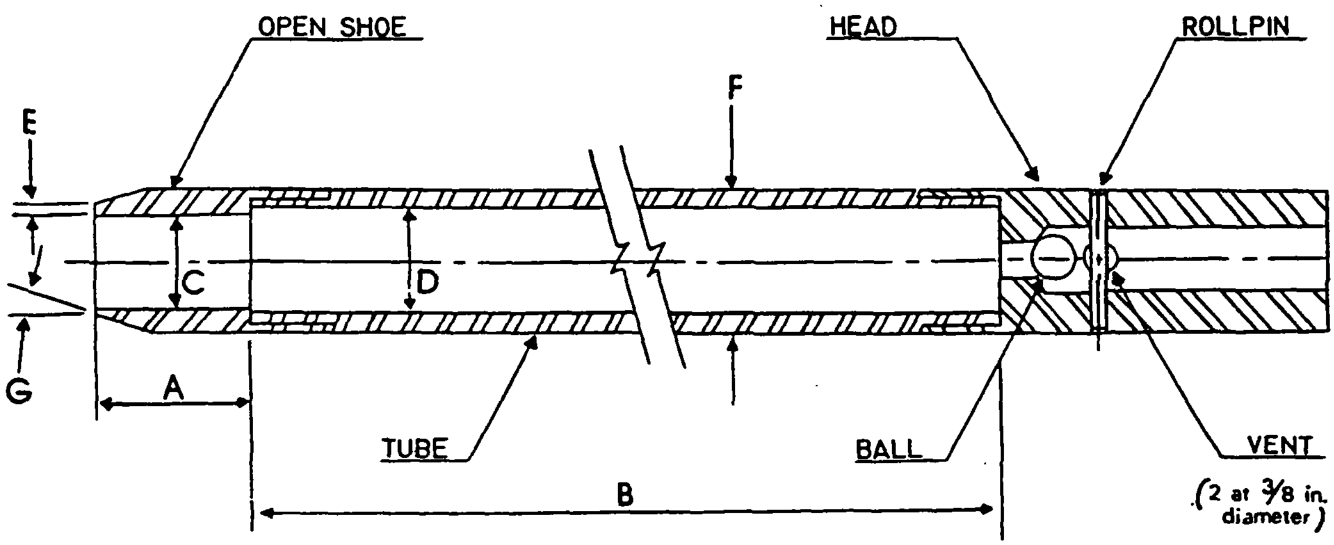


FIG. 1 Definitions of the Number of Rope Turns and the Angle for (a) Counterclockwise Rotation and (b) Clockwise Rotation of the Cathead



A = 1.0 to 2.0 in. (25 to 50 mm)
B = 18.0 to 30.0 in. (0.457 to 0.762 m)
C = 1.375 ± 0.005 in. (34.93 ± 0.13 mm)
D = 1.50 ± 0.05 − 0.00 in. (38.1 ± 1.3 − 0.0 mm)
E = 0.10 ± 0.02 in. (2.54 ± 0.25 mm)
F = 2.00 ± 0.05 − 0.00 in. (50.8 ± 1.3 − 0.0 mm)
G = 16.0° to 23.0°

The 1½ in. (38 mm) inside diameter split barrel may be used with a 16-gage wall thickness split liner. The penetrating end of the drive shoe may be slightly rounded. Metal or plastic retainers may be used to retain soil samples.

FIG. 2 Split-Barrel Sampler

003RI8/89WP3K

AMERICAN SOCIETY FOR TESTING AND MATERIALS

Standard Practice for

THIN-WALLED TUBE SAMPLING OF SOILS[1]

This standard is issued under the fixed designation D 1587; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of the last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (€) indicates an editorial change since the last revision or reapproval.

This practice has been approved for use by agencies of the Department of Defense and for listing in the DOD Index os Specifications and Standards.

1. Scope

1.1 This practice covers a procedure for using a thin-walled metal tube to recover relatively undisturbed soil samples suitable for laboratory tests of structural properties. Thin-walled tubes used in piston, plug, or rotary-type samplers, such as the Denison or Pitcher, must comply with the portions of this practice which describe the thin-walled tubes (5.3).

NOTE 1—This practice does not apply to liners used within the above samplers.

2. Applicable Documents

2.1 ASTM Standards:

D2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)[2]

D3550 Practice for Ring-Lined Barrel Sampling of Soils[2]

D4220 Practice for Preserving and Transporting Soil Samples[2]

3. Summary of Practice

3.1 A relatively undisturbed sample is obtained by pressing a thin-walled metal tube into the in-situ soil, removing the soil-filled tube, and sealing the ends to prevent the soil from being disturbed or losing moisture.

4. Significance and Use

4.1 This practice, or Practice D3550, is used when it is necessary to obtain a relatively undisturbed specimen suitable for laboratory tests of structural properties or other tests that might be influenced by soil disturbance.

5. Apparatus

5.1 Drilling Equipment—Any drilling equipment may be used that provides a reasonably clean hole; that does not disturb the soil to be sampled; and that does not hinder the penetration of the thin-walled sampler. Open borehole diameter and the inside diameter of driven casing or hollow stem auger shall not exceed 3.5 times the outside diameter of the thin-walled tube.

5.2 Sampler Insertion Equipment, shall be adequate to provide a relatively rapid continuous penetration force. For hard formations it may be necessary, although not recommended, to drive the thin-walled tube sampler.

5.3 Thin-Walled Tubes, should be manufactured as shown in Fig. 1. They should have an outside diameter of 2 to 5 in. and be made of metal having adequate strength for use in the soil and formation intended. Tubes shall be clean and free of all surface irregularities including projecting weld seams.

5.3.1 Length of Tubes—See Table 1 and 6.4.

5.3.2 Tolerances, shall be within the limits shown in Table 2.

5.3.3 Inside Clearance Ratio, should be 1% or as specified by the engineer or geologist for the soil and formation to be sampled. Generally, the inside clearance ratio used should increase with the increase in plasticity of the soil being sampled. See Fig. 1 for definition of inside clearance ratio.

5.3.4 Corrosion Protection—Corrosion, whether from galvanic or chemical reaction, can damage or destroy both the thin-walled tube and the sample. Severity of damage is a function of time as well as interaction between the sample and the tube. Thin-walled tubes should have some form of protective coating. Tubes which will contain samples for more than 72 h shall be coated. The type of coating to be used may vary depending upon the material to be sampled. Coatings may include a light coat of lubricating oil, lacquer, epoxy, Teflon, and others. Type of coating must be specified by the engineer or geologist if storage will exceed 72 h. Plating of the tubes or alternate base metals may be specified by the engineer or geologist.

5.4 Sampler Head, serves to couple the thin-walled tube to the insertion equipment and, together with the thin-walled tube, comprises the thin-walled tube sampler. The sampler head shall contain a suitable check valve and a venting area to the outside equal to or greater than the area through the check valve. Attachment of the head to the tube shall be concentric and coaxial to assure uniform application of force to the tube by the sampler insertion equipment.

6. Procedure

6.1 Clean out the borehole to sampling elevation using whatever method is preferred that will ensure the material to be sampled is not disturbed. If groundwater is encountered, maintain the liquid level in the borehole at or above ground water level during the sampling operation.

6.2 Bottom discharge bits are not permitted. Side discharge bits may be used, with caution. Jetting through an open-tube sampler to clean out the borehole to sampling elevation is not permitted. Remove loose material from the center of a casing or hollow stem auger as carefully as possible to avoid disturbance of the material to be sampled.

[1]This practice is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.02 on Sampling and Related Field Testing for Soil Investigation.

Current edition approved Aug. 17, 1983. Published October 1983. Originally published as D 1587-58T. Last previous edition D 1587-74.

[2]Annual Book of ASTM Standards, Vol 04.08.

NOTE 2—Roller bits are available in downward-jetting and diffused-jet configurations. Downward-jetting configuration rock bits are not acceptable. Diffuse-jet configurations are generally acceptable.

6.3 Place the sample tube so that its bottom rests on the bottom of the hole. Advance the sampler without rotation by a continuous relatively rapid motion.

6.4 Determine the length of advance by the resistance and condition of the formation, but the length shall never exceed 5 to 10 diameters of the tube in sands and 10 to 15 diameters of the tube in clays.

NOTE 3—Weight of sample, laboratory handling capabilities, transportation problems, and commercial availability of tubes will generally limit maximum practical lengths to those shown in Table 1.

6.5 When the formation is too hard for push-type insertion, the tube may be driven or Practice D3550 may be used. Other methods, as directed by the engineer or geologist, may be used. If driving methods are used, the data regarding weight and fall of the hammer and penetration achieved must be shown in the report. Additionally, that tube must be prominently labeled a "driven sample."

6.6 In no case shall a length of advance be greater than the sample-tube length minus an allowance for the sampler head and a minimum of 3 in. for sludge-end cuttings.

NOTE 4—The tube may be rotated to shear bottom of the sample after pressing is complete.

6.7 Withdraw the sampler from the formation as carefully as possible in order to minimize disturbance of the sample.

7. Preparation for Shipment

7.1 Upon removal of the tube, measure the length of sample in the tube. Remove the disturbed material in the upper end of the tube and measure the length again. Seal the upper end of the tube. Remove at least 1 in. of material from the lower end of the tube. Use this material for soil description in accordance with Practice D2488. Measure the overall sample length. Seal the lower end of the tube. Alternatively, after measurement, the tube may be sealed without removal of soil from the ends of the tube if so directed by the engineer or geologist.

NOTE 5—Field extrusion and packaging of extruded samples under the specific direction of a geotechnical engineer or geologist is permitted.

NOTE 6—Tubes sealed over the ends as opposed to those sealed with expanding packers should contain end padding in end voids in order to prevent drainage or movement of the sample within the tube.

7.2 Prepare and immediately affix labels or apply markings as necessary to identify the sample. Assure that the markings or labels are adequate to survive transportation and storage.

8. Report

8.1 The appropriate information is required as follows:

8.1.1 Name and location of the project,

8.1.2 Boring number and precise location on project,

8.1.3 Surface elevation or reference to a datum,

8.1.4 Date and time of boring—start and finish,

8.1.5 Depth to top of sample and number of samples,

8.1.6 Description of sampler: size, type of metal, type of coating,

8.1.7 Method of sampler insertion: push or drive,

8.1.8 Method of drilling, size of hole, casing, and drilling fluid used,

8.1.9 Depth to groundwater level: date and time measured,

8.1.10 Any possible current or tidal effect on water level,

8.1.11 Soil description in accordance with Practice D2488,

8.1.12 Length of sampler advance, and

8.1.13 Recovery: length of sample obtained.

9. Precision and Bias

9.1 This practice does not produce numerical data; therefore, a precision and bias statement is not applicable.

TABLE 1 Suitable Thin-Walled Steel Sample Tubes[A]

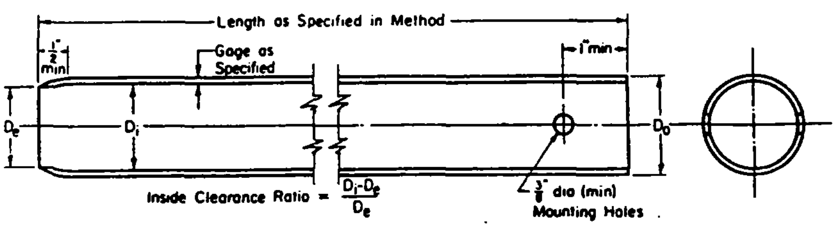
Outside diameter:			
in.	2	3	5
mm	50.8	76.2	127
Wall thickness:			
Bwg	18	16	11
in.	0.049	0.065	0.120
mm	1.24	1.65	3.05
Tube length.			
in.	36	36	54
m	0.91	0.91	1.45
Clearance ratio, %	1	1	1

[A]The three diameters recommended in Table 1 are indicated for purposes of standardization, and are not intended to indicate that sampling tubes of intermediate or larger diameters are not acceptable. Lengths of tubes shown are illustrative. Proper lengths to be determined as suited to field conditions.

TABLE 2 Dimensional Tolerances for Thin-Walled Tubes

Nominal Tube Diameters from Table 1[A] Tolerances, in.			
Size Outside Diameter	2	3	5
Outside diameter	+0.007	+0.010	+0.015
	−0.000	−0.000	−0.000
Inside diameter	+0.000	+0.000	+0.000
	−0.007	−0.010	−0.015
Wall thickness	±0.007	±0.010	±0.015
Ovality	0.015	0.020	0.030
Straightness	0.030/ft	0.030/ft	0.030/ft

[A]Intermediate or larger diameters should be proportional. Tolerances shown are essentially standard commercial manufacturing tolerances for seamless steel mechanical tubing. Specify only two of the first three tolerances; that is, O.D. and I.D., or O.D. or O.D. and Wall, or I.D. and Wall.



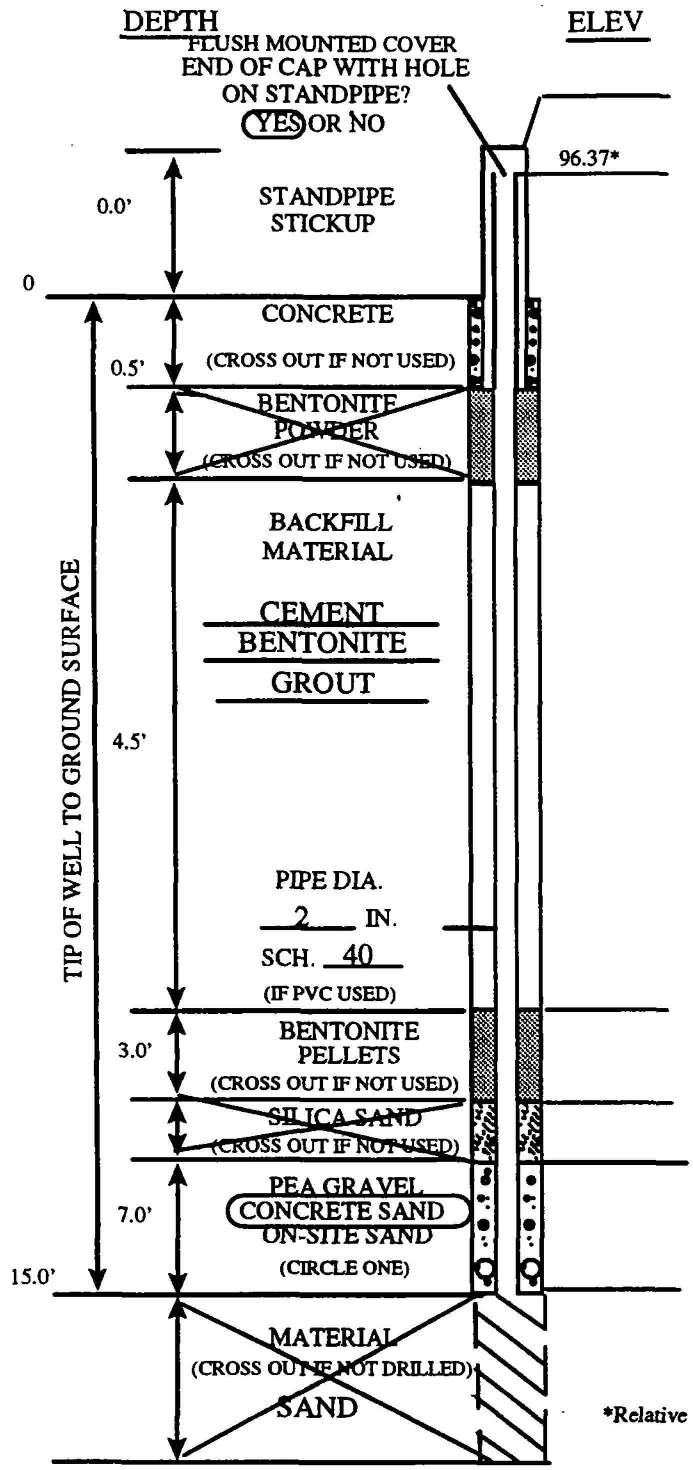
NOTE 1—Minimum of two mounting holes on opposite sides for 2 to 3½ in. sampler.
NOTE 2—Minimum of four mounting holes spaced at 90° for samplers 4 in. and larger.
NOTE 3—Tube held with hardened screws.
NOTE 4—Two-inch outside-diameter tubes are specified with an 18-gage wall thickness to comply with area ratio criteria accepted for "undisturbed samples." Users are advised that such tubing is difficult to locate and can be extremely expensive in small quantities. Sixteen-gage tubes are generally readily available.

Metric Equivalents

in.	mm
3/8	[illegible]
½	12.7
1	25.4
2	50.8
3½	88.9
4	101.6

FIG. 1 Thin-Walled Tube for Sampling

STS Field Well Installation Diagram



1) TYPE OF PIPE
PVC, GALVANIZED, STAINLESS, OTHER ________

2) TYPE OF PIPE JOINTS
BELLED, COUPLINGS, THREADED, OTHER ________

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ________

4) SCREEN SLOT SIZE 0.01 inches

5) SCREEN LENGTH 5 feet

6) INSTALLED PROCTECTOR PIPE W/LOCK? YES OR NO

7) DRILLING METHOD Solid Stem Augers
DRILLING FLUID Water
BOREHOLE DIAMETER 4 inches

8) BACKFILL MATERIAL INSTALATION FROM
SURFACE, TREMIE

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 GAL, 10 GAL, 15 GAL, OTHER 4 gals

11) WATER CLARITY BEFORE DEVELOPMENT
CLEAR, TURBID, OPAQUE

12) WATER CLARITY AFTER DEVELOPMENT
CLEAR, TURBID, OPAQUE

13) DID THE WATER SMELL? YES OR NO

14) WATER LEVEL SUMMARY
1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
13 feet FT OR DRY

2) OTHER MEASUREMENTS: SEE OBSERVATION WELL SUMMARY

DATE 9/11/92 , 11.09 FT FROM T, ST. PIPE
DATE ________ , ________ FT FROM T, ST. PIPE
DATE ________ , ________ FT FROM T, ST. PIPE
DATE ________ , ________ FT FROM T, ST. PIPE

*Relative to benchmark elevation = 100.00 feet

WELL NO. MW-128 DATE INSTALLED 9/5/92 DRILL RIG DR-9

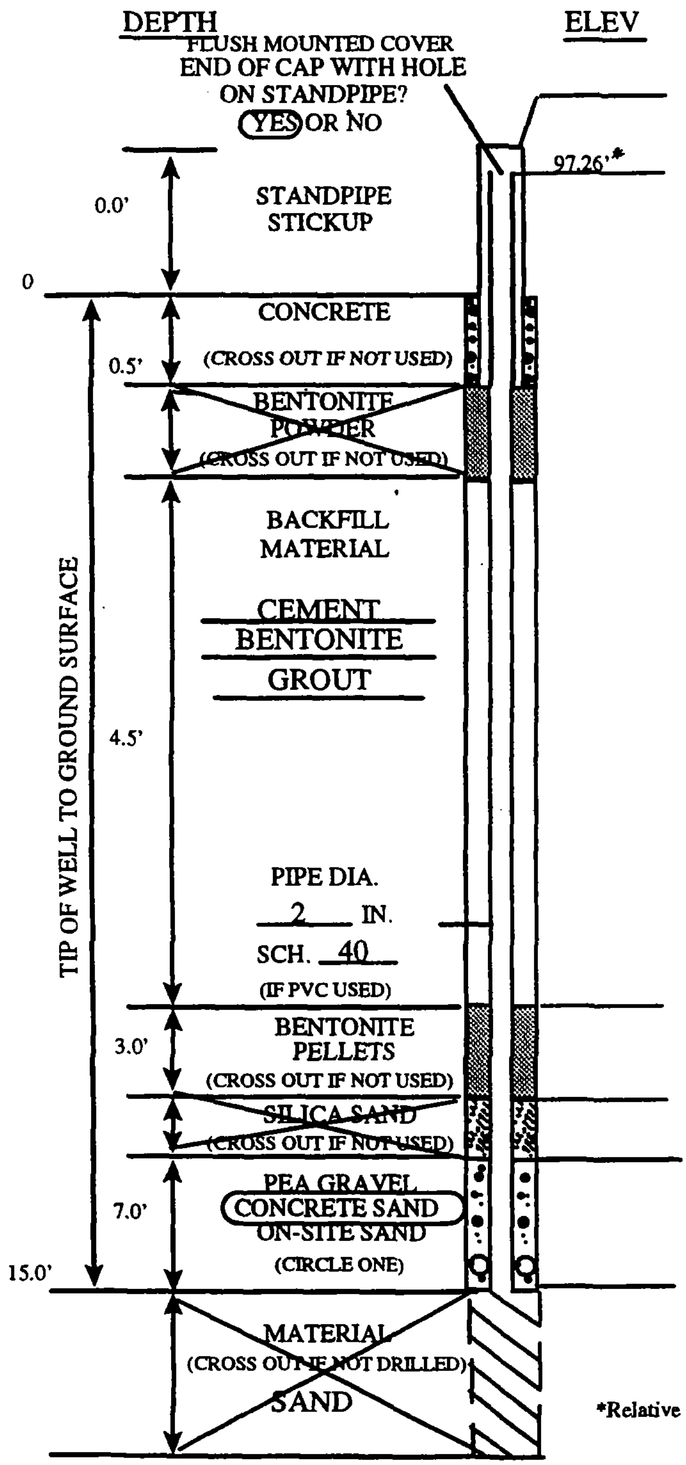
DRILLER Dumas DRILL CREW Deon

JOB/CLIENT Proposed NWMH Facility Redevelopment Site/Power/CRSS STS PROJECT NO. 27313-XH

(Power/CRSS_mw-128/m11draw/nt)

(VERSION 3: 08/91 - M11DRAW "FIELD_WELL_KAS")

STS Field Well Installation Diagram



1) TYPE OF PIPE
PVC, GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SLOT SIZE 0.01 inches

5) SCREEN LENGTH 5 feet

6) INSTALLED PROCTECTOR PIPE W/LOCK? YES OR NO

7) DRILLING METHOD Solid Stem Augers
DRILLING FLUID Water
BOREHOLE DIAMETER 4 inches

8) BACKFILL MATERIAL INSTALATION FROM
SURFACE, TREMIE

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 GAL, 10 GAL, 15 GAL, OTHER 4 gals

11) WATER CLARITY BEFORE DEVELOPMENT
CLEAR, TURBID, OPAQUE

12) WATER CLARITY AFTER DEVELOPMENT
CLEAR, TURBID, OPAQUE

13) DID THE WATER SMELL? YES OR NO

14) WATER LEVEL SUMMARY
1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
13 feet FT OR DRY

2) OTHER MEASUREMENTS: SEE OBSERVATION WELL SUMMARY

DATE 9/11/92, 12.85 FT FROM T, ST. PIPE
DATE ______, ______ FT FROM T, ST. PIPE
DATE ______, ______ FT FROM T, ST. PIPE
DATE ______, ______ FT FROM T, ST. PIPE

*Relative to benchmark elevation = 100.00 feet

WELL NO. MW-129 DATE INSTALLED 9/5/92 DRILL RIG DR-9

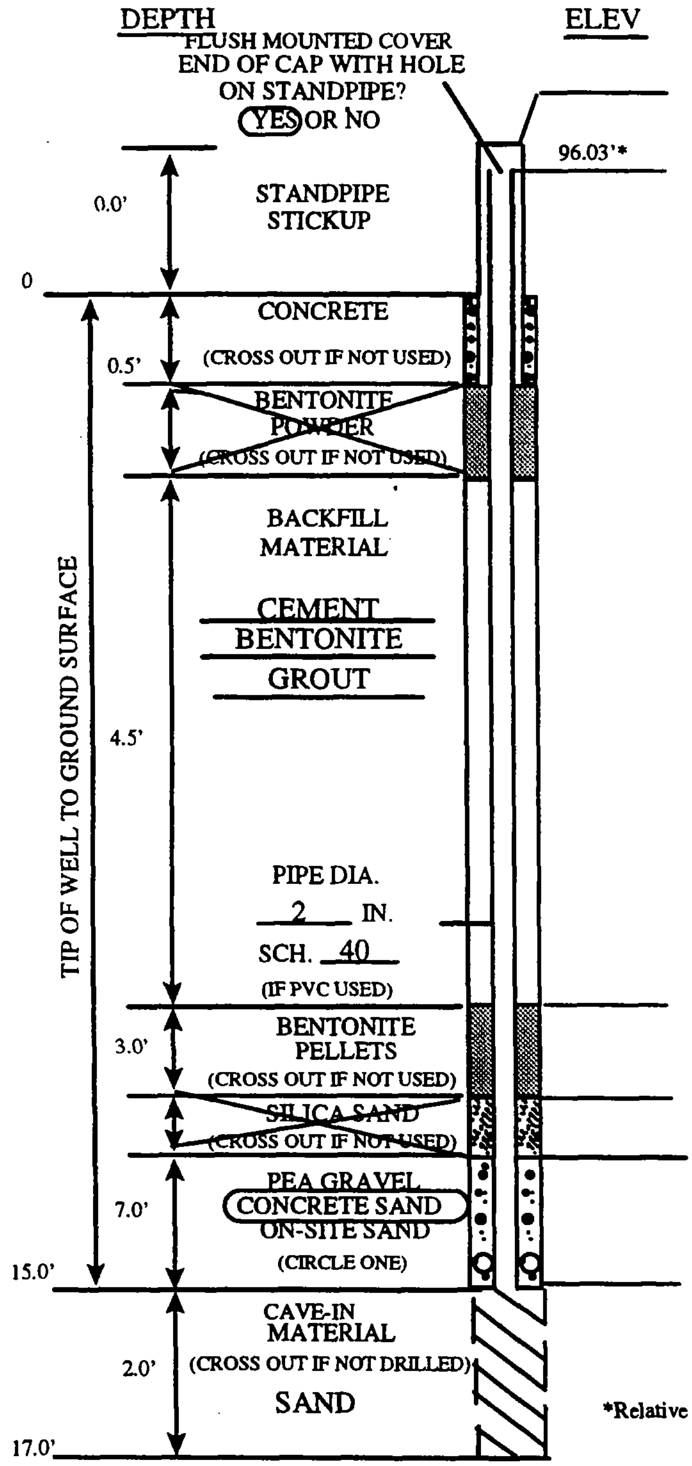
DRILLER Dumas DRILL CREW Deon

JOB/CLIENT Proposed NWMH Facility Redevelopment Site/Power/CRSS STS PROJECT NO. 27313-XH

(Power/CRSS_mw-129/m11draw/nt)

(VERSION 3: 08/91 - M11DRAW "FIELD_WELL_KAS")

STS Field Well Installation Diagram



1) TYPE OF PIPE
PVC, GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SLOT SIZE 0.01 inches

5) SCREEN LENGTH 5 feet

6) INSTALLED PROCTECTOR PIPE W/LOCK? YES OR NO

7) DRILLING METHOD Solid Stem Augers
DRILLING FLUID None
BOREHOLE DIAMETER 4 inches

8) BACKFILL MATERIAL INSTALATION FROM
SURFACE, TREMIE

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 GAL, 10 GAL, 15 GAL, OTHER 4 gals

11) WATER CLARITY BEFORE DEVELOPMENT
CLEAR, TURBID, OPAQUE

12) WATER CLARITY AFTER DEVELOPMENT
CLEAR, TURBID, OPAQUE

13) DID THE WATER SMELL? YES OR NO

14) WATER LEVEL SUMMARY
1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
12.0 FT OR DRY

2) OTHER MEASUREMENTS: SEE OBSERVATION WELL SUMMARY

DATE 9/11/92 , 11.87 FT FROM T, ST. PIPE
DATE ______ , ______ FT FROM T, ST. PIPE
DATE ______ , ______ FT FROM T, ST. PIPE
DATE ______ , ______ FT FROM T, ST. PIPE

*Relative to benchmark elevation = 100.00 feet

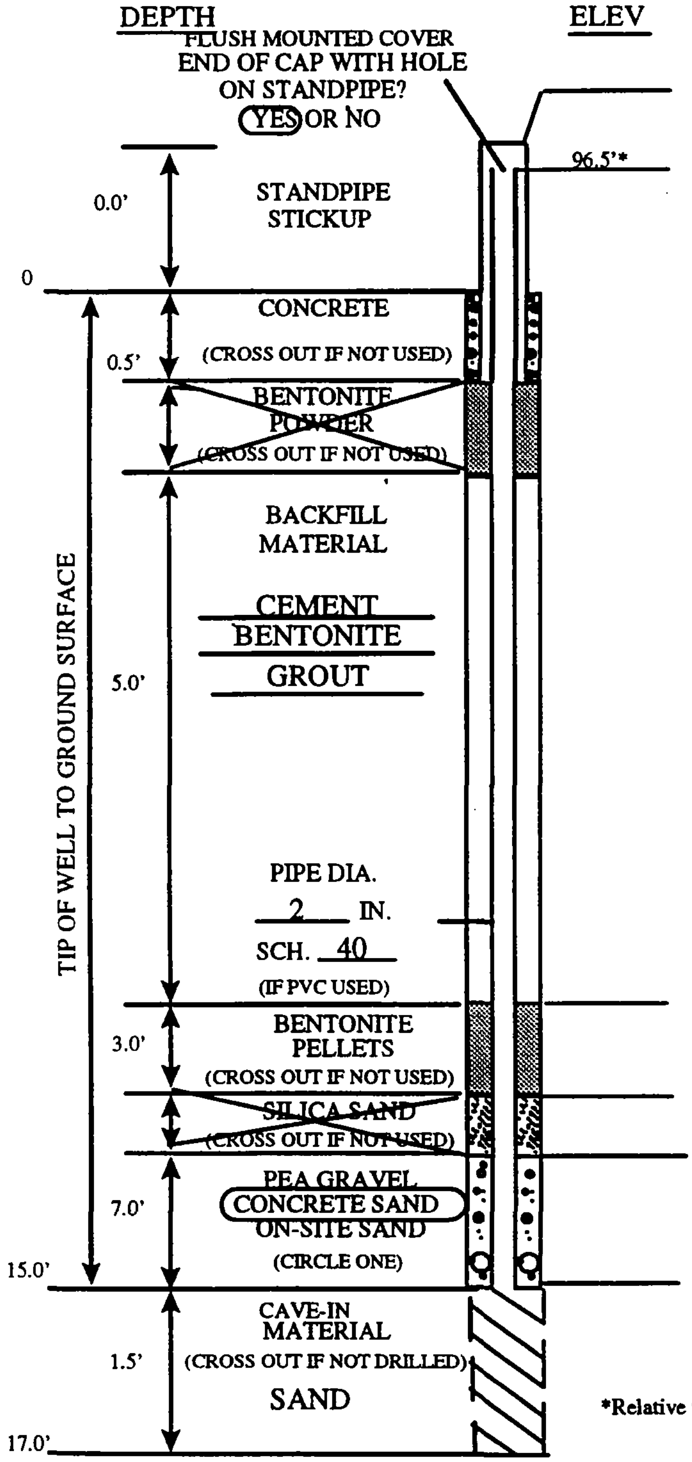
WELL NO. MW-130 DATE INSTALLED 9/5/92 DRILL RIG DR-9

DRILLER Dumas DRILL CREW Deon

JOB/CLIENT Proposed NWMH Facility Redevelopment Site/Power/CRSS STS PROJECT NO. 27313-XH

(POWER/CRSS_MW-130/M11DRAW/NT) (VERSION 3: 08/91 - M11DRAW "FIELD_WELL_KAS")

STS Field Well Installation Diagram



1) TYPE OF PIPE
PVC, GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SLOT SIZE 0.01 inches

5) SCREEN LENGTH 5 feet

6) INSTALLED PROCTECTOR PIPE W/LOCK? YES OR NO

7) DRILLING METHOD Solid Stem Augers
DRILLING FLUID None
BOREHOLE DIAMETER 4 inches

8) BACKFILL MATERIAL INSTALATION FROM
SURFACE, TREMIE

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 GAL, 10 GAL, 15 GAL, OTHER 4 gals

11) WATER CLARITY BEFORE DEVELOPMENT
CLEAR, TURBID, OPAQUE

12) WATER CLARITY AFTER DEVELOPMENT
CLEAR, TURBID, OPAQUE

13) DID THE WATER SMELL? YES OR NO

14) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
13 FT OR DRY

2) OTHER MEASUREMENTS: SEE OBSERVATION WELL SUMMARY

DATE 9/11/92, 12.22 FT FROM T, ST. PIPE
DATE ______, ______ FT FROM T, ST. PIPE
DATE ______, ______ FT FROM T, ST. PIPE
DATE ______, ______ FT FROM T, ST. PIPE

*Relative to benchmark elevation = 100.00 feet

WELL NO. MW_131 DATE INSTALLED 9/5/92 DRILL RIG DR-9

DRILLER Dumas DRILL CREW Deon

JOB/CLIENT Proposed NWMH Facility Redevelopment Site/Power/CRSS STS PROJECT NO. 27313-XH

(POWER/CRSS_MW-131/M11DRAW/NT)

(VERSION 3: 08/91 - M11DRAW "FIELD_WELL_KAS")

Sample ID: TP-1

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/Kg	Analysis mg/Kg
1,1-Dichloroethane	0.005	BDL
1,1-Dichloroethene	0.005	BDL
1,1,1-Trichloroethane	0.005	BDL
1,1,2-Trichloroethane	0.005	BDL
1,1,2,2-Tetrachloroethane	0.005	BDL
1,2-Dichloroethane	0.005	BDL
1,2-Dichloropropane	0.005	BDL
1,2,3-Trichloropropane	0.005	BDL
1,4-Dichloro-2-butene	0.005	BDL
2-Butanone (MEK)	0.25	BDL
2-Chloroethyl vinyl ether	0.005	BDL
2-Hexanone	0.050	BDL
4-Methyl-2-pentanone(MIBK)	0.025	BDL
Acetone	0.38	BDL
Acrolein	0.005	BDL
Acrylonitrile	0.005	BDL
Benzene	0.005	BDL
Bromodichloromethane	0.005	BDL
Bromomethane	0.025	BDL
Carbon disulfide	0.005	BDL
Chlorobenzene	0.005	BDL
Chloroethane	0.025	BDL
Chloromethane	0.025	BDL
cis-1,3-Dichloropropene	0.005	BDL
Dibromochloroemethane	0.005	BDL
Dibromomethane	0.005	BDL
Dichlorodifluoromethane	0.005	BDL
Ethylbenzene	0.005	BDL
Iodomethane	0.005	BDL
Methylbenzene (Toluene)	0.005	BDL
Methylene chloride	0.005	BDL
Styrene	0.005	BDL
Tetrachloroethene	0.005	0.044
Tetrachloromethane	0.005	BDL
trans-1,2-Dichloroethene	0.005	BDL
trans-1,3-Dichloropropene	0.005	BDL
Tribromomethane (Bromoform)	0.005	BDL
Trichloroethene	0.005	0.023
Trichlorofluoromethane	0.005	BDL
Trichloromethane (Chloroform)	0.005	BDL
Vinyl acetate	0.13	BDL
Vinyl chloride	0.025	BDL
Xylenes (Total)	0.015	BDL

Sample ID: TP-2

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/Kg	Analysis mg/Kg
1,1-Dichloroethane	0.005	BDL
1,1-Dichloroethene	0.005	BDL
1,1,1-Trichloroethane	0.005	BDL
1,1,2-Trichloroethane	0.005	BDL
1,1,2,2-Tetrachloroethane	0.005	BDL
1,2-Dichloroethane	0.005	BDL
1,2-Dichloropropane	0.005	BDL
1,2,3-Trichloropropane	0.005	BDL
1,4-Dichloro-2-butene	0.005	BDL
2-Butanone (MEK)	0.25	BDL
2-Chloroethyl vinyl ether	0.005	BDL
2-Hexanone	0.050	BDL
4-Methyl-2-pentanone(MIBK)	0.025	BDL
Acetone	0.38	BDL
Acrolein	0.005	BDL
Acrylonitrile	0.005	BDL
Benzene	0.005	BDL
Bromodichloromethane	0.005	BDL
Bromomethane	0.025	BDL
Carbon disulfide	0.005	BDL
Chlorobenzene	0.005	BDL
Chloroethane	0.025	BDL
Chloromethane	0.025	BDL
cis-1,3-Dichloropropene	0.005	BDL
Dibromochloroemethane	0.005	BDL
Dibromomethane	0.005	BDL
Dichlorodifluoromethane	0.005	BDL
Ethylbenzene	0.005	BDL
Iodomethane	0.005	BDL
Methylbenzene (Toluene)	0.005	BDL
Methylene chloride	0.005	BDL
Styrene	0.005	BDL
Tetrachloroethene	0.005	0.036
Tetrachloromethane	0.005	BDL
trans-1,2-Dichloroethene	0.005	BDL
trans-1,3-Dichloropropene	0.005	BDL
Tribromomethane (Bromoform)	0.005	BDL
Trichloroethene	0.005	BDL
Trichlorofluoromethane	0.005	BDL
Trichloromethane (Chloroform)	0.005	BDL
Vinyl acetate	0.13	BDL
Vinyl chloride	0.025	BDL
Xylenes (Total)	0.015	BDL

Sample ID: TP-3

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/Kg	Analysis mg/Kg
1,1-Dichloroethane	0.005	BDL
1,1-Dichloroethene	0.005	BDL
1,1,1-Trichloroethane	0.005	BDL
1,1,2-Trichloroethane	0.005	BDL
1,1,2,2-Tetrachloroethane	0.005	BDL
1,2-Dichloroethane	0.005	BDL
1,2-Dichloropropane	0.005	BDL
1,2,3-Trichloropropane	0.005	BDL
1,4-Dichloro-2-butene	0.005	BDL
2-Butanone (MEK)	0.25	BDL
2-Chloroethyl vinyl ether	0.005	BDL
2-Hexanone	0.050	BDL
4-Methyl-2-pentanone(MIBK)	0.025	BDL
Acetone	0.38	BDL
Acrolein	0.005	BDL
Acrylonitrile	0.005	BDL
Benzene	0.005	BDL
Bromodichloromethane	0.005	BDL
Bromomethane	0.025	BDL
Carbon disulfide	0.005	BDL
Chlorobenzene	0.005	BDL
Chloroethane	0.025	BDL
Chloromethane	0.025	BDL
cis-1,3-Dichloropropene	0.005	BDL
Dibromochloroemethane	0.005	BDL
Dibromomethane	0.005	BDL
Dichlorodifluoromethane	0.005	BDL
Ethylbenzene	0.005	BDL
Iodomethane	0.005	BDL
Methylbenzene (Toluene)	0.005	BDL
Methylene chloride	0.005	BDL
Styrene	0.005	BDL
Tetrachloroethene	0.005	BDL
Tetrachloromethane	0.005	BDL
trans-1,2-Dichloroethene	0.005	BDL
trans-1,3-Dichloropropene	0.005	BDL
Tribromomethane (Bromoform)	0.005	BDL
Trichloroethene	0.005	BDL
Trichlorofluoromethane	0.005	BDL
Trichloromethane (Chloroform)	0.005	BDL
Vinyl acetate	0.13	BDL
Vinyl chloride	0.025	BDL
Xylenes (Total)	0.015	BDL

Sample ID: TP-3 (cont'd)

TCLP METALS
Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.1	BDL
Barium	0.1	0.3
Mercury	0.05	BDL

Method: GC/ECD

PCBs:	0.5 mg/Kg	BDL

Sample ID: TP-4

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/Kg	Analysis mg/Kg
1,1-Dichloroethane	0.005	BDL
1,1-Dichloroethene	0.005	BDL
1,1,1-Trichloroethane	0.005	BDL
1,1,2-Trichloroethane	0.005	BDL
1,1,2,2-Tetrachloroethane	0.005	BDL
1,2-Dichloroethane	0.005	BDL
1,2-Dichloropropane	0.005	BDL
1,2,3-Trichloropropane	0.005	BDL
1,4-Dichloro-2-butene	0.005	BDL
2-Butanone (MEK)	0.25	BDL
2-Chloroethyl vinyl ether	0.005	BDL
2-Hexanone	0.050	BDL
4-Methyl-2-pentanone(MIBK)	0.025	BDL
Acetone	0.38	BDL
Acrolein	0.005	BDL
Acrylonitrile	0.005	BDL
Benzene	0.005	BDL
Bromodichloromethane	0.005	BDL
Bromomethane	0.025	BDL
Carbon disulfide	0.005	0.014
Chlorobenzene	0.005	BDL
Chloroethane	0.025	BDL
Chloromethane	0.025	BDL
cis-1,3-Dichloropropene	0.005	BDL
Dibromochloroemethane	0.005	BDL
Dibromomethane	0.005	BDL
Dichlorodifluoromethane	0.005	BDL
Ethylbenzene	0.005	BDL
Iodomethane	0.005	BDL
Methylbenzene (Toluene)	0.005	BDL
Methylene chloride	0.005	BDL
Styrene	0.005	BDL
Tetrachloroethene	0.005	BDL
Tetrachloromethane	0.005	0.014
trans-1,2-Dichloroethene	0.005	BDL
trans-1,3-Dichloropropene	0.005	BDL
Tribromomethane (Bromoform)	0.005	BDL
Trichloroethene	0.005	BDL
Trichlorofluoromethane	0.005	BDL
Trichloromethane (Chloroform)	0.005	BDL
Vinyl acetate	0.13	BDL
Vinyl chloride	0.025	BDL
Xylenes (Total)	0.015	BDL

Sample ID: TP-6

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/Kg	Analysis mg/Kg
1,1-Dichloroethane	0.005	BDL
1,1-Dichloroethene	0.005	BDL
1,1,1-Trichloroethane	0.005	BDL
1,1,2-Trichloroethane	0.005	BDL
1,1,2,2-Tetrachloroethane	0.005	BDL
1,2-Dichloroethane	0.005	BDL
1,2-Dichloropropane	0.005	BDL
1,2,3-Trichloropropane	0.005	BDL
1,4-Dichloro-2-butene	0.005	BDL
2-Butanone (MEK)	0.25	BDL
2-Chloroethyl vinyl ether	0.005	BDL
2-Hexanone	0.050	BDL
4-Methyl-2-pentanone(MIBK)	0.025	BDL
Acetone	0.38	BDL
Acrolein	0.005	BDL
Acrylonitrile	0.005	BDL
Benzene	0.005	BDL
Bromodichloromethane	0.005	BDL
Bromomethane	0.025	BDL
Carbon disulfide	0.005	BDL
Chlorobenzene	0.005	BDL
Chloroethane	0.025	BDL
Chloromethane	0.025	BDL
cis-1,3-Dichloropropene	0.005	BDL
Dibromochloroemethane	0.005	BDL
Dibromomethane	0.005	BDL
Dichlorodifluoromethane	0.005	BDL
Ethylbenzene	0.005	BDL
Iodomethane	0.005	BDL
Methylbenzene (Toluene)	0.005	BDL
Methylene chloride	0.005	BDL
Styrene	0.005	BDL
Tetrachloroethene	0.005	BDL
Tetrachloromethane	0.005	BDL
trans-1,2-Dichloroethene	0.005	BDL
trans-1,3-Dichloropropene	0.005	BDL
Tribromomethane (Bromoform)	0.005	BDL
Trichloroethene	0.005	BDL
Trichlorofluoromethane	0.005	BDL
Trichloromethane (Chloroform)	0.005	BDL
Vinyl acetate	0.13	BDL
Vinyl chloride	0.025	BDL
Xylenes (Total)	0.015	BDL

MDL = Method Detection Limit
BDL = Below Detection Limit

Respectfully submitted,

Douglas Weir

Douglas Weir, Ph.D.
Lab Director
Quality Analytical Labs, Inc.

STS CHAIN OF CUSTODY RECORD

NO. 1907 RECORD NO.______ THROUGH______

Contact person David Grunman
Phone No. 708 772-6520
Project No. 21313-XII PO No. [illegible]
STS Office Northbrook

SPECIAL HANDLING REQUEST
☐ RUSH ☐ VERBAL ☐ OTHER

Laboratory [illegible]
Contact Person [illegible]
Phone No. 708-812-0061
Results Due [illegible] 1992

Sample I D	Date	Time	Grab	Composite	No. of Containers	Sample Type (Water, soil air, sludge, etc.)	Preservation Y	Preservation N	Field Data PID/FID Ambient	Field Data PID/FID Sample	PH	Spec. Cond.	Analysis Request	Comments on Samples (Include Major Contaminants)
TP1	7/22/92	[illegible]	X		3	Soil	X		0				VOC	
TP2	↓	↓	X		3	↓	X		↓				VOC	
TP3	↓	↓	X		3	↓	X		↓				VOC, TCLP 8 RCRA Metals, PCB	
TP4	↓	↓	X		3	↓	X			↓			VOC	
TP6	↓	12:30	X		3	↓	X			0			VOC	
													[illegible]	[illegible]
													[illegible]	[illegible]

Collected by: D. Grunman	Date 7/22/92	Time	Delivery by: D. Grunman	Date 7/22/92	Time
Received by:	Date	Time	Relinquished by: [illegible]	Date 7/22/92	Time 11:[illegible]
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received for lab by:	Date	Time	Relinquished by:	Date	Time

Laboratory Comments Only :: Seals Intact Upon Receipt ☒ YES ☐ NO ☐ N/A

Final disposition :

Comments (Weather Conditions, Precautions, Hazards) :
[illegible]
VOC [illegible] GC/MS

Distribution: Original and Green - Laboratory   Yellow - As needed   Pink - Transporter   Goldenrod - STS Project File
Instruction to Laboratory: Forward completed original to STS with analytical results. Retain green copy.

3/88

CLIENT STS CONSULTANTS
JOB NO. CH920797
PROJECT NO. 27313-XH

METHOD: 8240
SOIL

EPA TARGET COMPOUND LIST (TCL)
VOLATILE COMPOUNDS
ug/kg

Dilution Factor (DF)	1	1				Lower Limits Quantitation (LLD) with no Dilution*
Method Blank	VS0802	VS0802				
Client I.D.	108	METHOD BLANK				
Compound / Lab I.D.	20797 001	VS0802				
Chloromethane	U	U				10
Bromomethane	U	U				10
Vinyl Chloride	U	U				10
Chloroethane	U	U				10
Methylene Chloride	U	U				5
Acetone	31	U				10
Carbon Disulfide	U	U				5
1,1-Dichloroethene	U	U				5
1,1-Dichloroethane	U	U				5
trans-1,2-Dichloroethene	U	U				5
Chloroform	U	U				5
1,2-Dichloroethane	U	U				5
2-Butanone	U	U				10
1,1 1-Trichlorethane	U	U				5
Carbon Tetrachloride	U	U				5
Vinyl Acetate	U	U				10
Bromodichloromethane	U	U				5
1,2-Dichloropropane	U	U				5
Trans-1,3-dichloropropene	U	U				5
Trichloroethylene	U	U				5
Dibromochloromethane	U	U				5
1,1, 2-Trichloroethane	U	U				5
Benzene	U	U				5
cis-1, 3-Dichloropropene	U	U				5
2-Chloroethylvinylether	U	U				5
Bromoform	U	U				5
4-Methyl-2-Pentanone	U	U				10
2-Hexanone	U	U				10
Tetrachloroethylene	U	U				5
1,1,2,2-Tetrachloroethane	U	U				5
Toluene	6	U				5
Chlorobenzene	U	U				5
Ethylbenzene	86	U				5
Styrene	U	U				5
Total Xylenes	240	U				5

*MDL (Minimum Detection Limit) = LLD x DF

POLYNUCLEAR AROMATIC
HYDROCARBONS (PNA)
SW-846 METHOD 8310-SPECIAL

CLIENT:	STS CONSULTANTS	DATE RECEIVED:	07/29/92
CLIENT PROJECT ID:	27313-XH	DATE SAMPLED:	07/28/92
IEA PROJECT ID:	CH920797	DATE EXTRACTED:	08/02/92
IEA SAMPLE ID:	20797001	DATE ANALYZED:	08/12/92
CLIENT SAMPLE ID:	108	ANALYSIS BY:	LAWHON
MATRIX:	SOIL	DILUTION FACTOR:	5.0

Number	Compound	Quantitation Limit (ug/kg)	Results Concentration (ug/kg)
1	Naphthalene	660	BQL
2	Acenaphthylene	660	5800
3	Acenaphthene	1200	BQL
4	Fluorene	140	18000
5	Phenanthrene	660	6000
6	Anthracene	660	21000
7	Fluoranthene	660	38000
8	Pyrene	180	12000
9	Benzo(a)anthracene	8.7	1300
10	Chrysene	100	1500
11	Benzo(b)fluoranthene	11	BQL
12	Benzo(k)fluoranthene	11	130
13	Benzo(a)pyrene	15	300
14	Dibenzo(a,h)anthracene	20	BQL
15	Benzo(g,h,i)perylene	51	300
16	Indeno(1,2,3-cd)pyrene	29	BQL

Comments:
Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit

POLYNUCLEAR AROMATIC
HYDROCARBONS (PNA)
SW-846 METHOD 8310-SPECIAL

CLIENT:	STS CONSULTANTS	DATE RECEIVED:	N/A
CLIENT PROJECT ID:	27313-XH	DATE SAMPLED:	N/A
IEA PROJECT ID:	CH920797	DATE EXTRACTED:	08/02/92
IEA SAMPLE ID:	610 B 477	DATE ANALYZED:	08/04/92
CLIENT SAMPLE ID:	METHOD BLANK	ANALYSIS BY:	LAWHON
MATRIX:	SOIL	DILUTION FACTOR:	1.0

Number	Compound	Quantitation Limit (ug/kg)	Results Concentration (ug/kg)
1	Naphthalene	660	BQL
2	Acenaphthylene	660	BQL
3	Acenaphthene	1200	BQL
4	Fluorene	140	BQL
5	Phenanthrene	660	BQL
6	Anthracene	660	BQL
7	Fluoranthene	660	BQL
8	Pyrene	180	BQL
9	Benzo(a)anthracene	8.7	BQL
10	Chrysene	100	BQL
11	Benzo(b)fluoranthene	11	BQL
12	Benzo(k)fluoranthene	11	BQL
13	Benzo(a)pyrene	15	BQL
14	Dibenzo(a,h)anthracene	20	BQL
15	Benzo(g,h,i)perylene	51	BQL
16	Indeno(1,2,3-cd)pyrene	29	BQL

Comments:
Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit

iea

IEA PROJECT#	CH920797
CLIENT PROJECT ID	27313-XH
MATRIX	SOIL

TOTAL PETROLEUM HYDROCARBONS
EPA METHOD 418.1
mg/kg

CLIENT ID	108	METHOD BLANK	
LAB ID	20797 001	TS0730	PQL
T. Petroleum Hydrocarbons	38	< 20	20

DATE EXTRACTED	07/30/92	07/30/92
DATE SAMPLED	07/28/92	
DATE ANALYZED	08/04/92	08/04/92
DILUTION FACTOR	1	1

IEA PROJECT# CH920797
CLIENT PROJECT ID 27313-XH
MATRIX SOIL

OIL & GREASE
EPA METHOD 418.1
mg/kg

CLIENT ID	108	METHOD BLANK	PQL
LAB ID	20797 001	TS0730	
OIL & GREASE	38	< 20	20

DATE EXTRACTED	07/30/92	07/30/92
DATE SAMPLED	07/28/92	
DATE ANALYZED	08/04/92	08/04/92
DILUTION FACTOR	1	1

POLYNUCLEAR AROMATIC
HYDROCARBONS (PNA)
SW–846 METHOD 8310–SPECIAL

CLIENT:	STS CONSULTANTS	DATE RECEIVED:	07/28/92
CLIENT PROJECT ID:	27313–XH	DATE SAMPLED:	07/27/92
IEA PROJECT ID:	CH920792	DATE ANALYZED:	08/05/92
IEA SAMPLE ID:	20792002	DILUTION FACTOR:	100
CLIENT SAMPLE ID:	109		
MATRIX:	SOIL		

Number	Compound	Quantitation Limit (ug/kg)	Results Concentration (ug/kg)
1	Naphthalene	6600	BQL
2	Acenaphthylene	6600	BQL
3	Acenaphthene	10000	54000
4	Fluorene	1900	BQL
5	Phenanthrene	500	BQL
6	Anthracene	400	7500
7	Fluoranthene	130	25000
8	Pyrene	1800	BQL
9	Benzo(a)anthracene	30	950
10	Chrysene	200	770
11	Benzo(b)fluoranthene	0.60	BQL
12	Benzo(k)fluoranthene	20	120
13	Benzo(a)pyrene	30	230
14	Indeno(1,2,3–cd)pyrene	290	BQL
15	Dibenzo(a,h)anthracene	60	BQL
16	Benzo(g,h,i)perylene	130	BQL

Comments:
Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit

CLIENT STS CONSULTANTS
JOB NO. CH920792
PROJECT NO. 27313-XH

METHOD: 8240
SOIL

EPA TARGET COMPOUND LIST (TCL)
VOLATILE COMPOUNDS
ug/kg

Dilution Factor (DF)	1	5	1	1	1	Lower Limits Quantitation (LLD) with no Dilution*
Method Blank	VS0731	VS0802	VS0731	VS0731	VS0802	
Client I.D.	115	109	118	METHOD BLANK	METHOD BLANK	
Compound / Lab I.D.	20792 001	20792 002	20792 003	VS0731	VS0802	
Chloromethane	U	UD	U	U	U	10
Bromomethane	U	UD	U	U	U	10
Vinyl Chloride	U	UD	U	U	U	10
Chloroethane	U	UD	U	U	U	10
Methylene Chloride	U	UD	U	U	U	5
Acetone	16	UD	U	U	U	10
Carbon Disulfide	U	UD	U	U	U	5
1,1-Dichloroethene	U	UD	U	U	U	5
1,1-Dichloroethane	U	UD	U	U	U	5
trans-1,2-Dichloroethene	U	UD	U	U	U	5
Chloroform	U	UD	U	U	U	5
1,2-Dichloroethane	U	UD	U	U	U	5
2-Butanone	U	UD	U	U	U	10
1,1 1-Trichlorethane	U	UD	U	U	U	5
Carbon Tetrachloride	U	UD	U	U	U	5
Vinyl Acetate	U	UD	U	U	U	10
Bromodichloromethane	U	UD	U	U	U	5
1,2-Dichloropropane	U	UD	U	U	U	5
Trans-1,3-dichloropropene	U	UD	U	U	U	5
Trichloroethylene	U	UD	U	U	U	5
Dibromochloromethane	U	UD	U	U	U	5
1,1, 2-Trichloroethane	U	UD	U	U	U	5
Benzene	U	UD	U	U	U	5
cis-1, 3-Dichloropropene	U	UD	U	U	U	5
2-Chloroethylvinylether	U	UD	U	U	U	5
Bromoform	U	UD	U	U	U	5
4-Methyl-2-Pentanone	U	UD	U	U	U	10
2-Hexanone	U	UD	U	U	U	10
Tetrachloroethylene	U	UD	U	U	U	5
1,1,2,2-Tetrachloroethane	U	UD	U	U	U	5
Toluene	U	UD	U	U	U	5
Chlorobenzene	U	UD	U	U	U	5
Ethylbenzene	14	UD	U	U	U	5
Styrene	U	UD	U	U	U	5
Total Xylenes	180	89	10	U	U	5

*MDL (Minimum Detection Limit) = LLD x DF

IEA PROJECT#	CH920792
CLIENT PROJECT ID	27313-XH
MATRIX	SOIL

TOTAL PETROLEUM HYDROCARBONS
EPA METHOD 418.1
mg/kg

CLIENT ID	115	109	118	METHOD BLANK	
LAB ID	20792 001	20792 002	20792 003	TS0730	PQL
T. Petroleum Hydrocarbons	31	13000	21	< 20	20

DATE EXTRACTED	07/30/92	07/30/92	07/30/92	07/30/92
DATE SAMPLED	07/27/92	07/24/92	07/27/92	
DATE ANALYZED	08/04/92	08/04/92	08/04/92	08/04/92
DILUTION FACTOR	1	100	1	1

POLYNUCLEAR AROMATIC
HYDROCARBONS (PNA)
SW-846 METHOD 8310-SPECIAL

CLIENT:	STS CONSULTANTS	DATE RECEIVED:	07/28/92
CLIENT PROJECT ID:	27313-XH	DATE SAMPLED:	07/27/92
IEA PROJECT ID:	CH920792	DATE ANALYZED:	08/05/92
IEA SAMPLE ID:	20792001	DILUTION FACTOR:	1.0
CLIENT SAMPLE ID:	115		
MATRIX:	SOIL		

Number	Compound	Quantitation Limit (ug/kg)	Results Concentration (ug/kg)
1	Naphthalene	100	BQL
2	Acenaphthylene	200	BQL
3	Acenaphthene	100	BQL
4	Fluorene	20.0	BQL
5	Phenanthrene	5.0	11
6	Anthracene	4.00	4.0
7	Fluoranthene	1.30	BQL
8	Pyrene	20.0	BQL
9	Benzo(a)anthracene	0.30	BQL
10	Chrysene	2.00	BQL
11	Benzo(b)fluoranthene	0.60	BQL
12	Benzo(k)fluoranthene	0.20	0.70
13	Benzo(a)pyrene	0.30	0.95
14	Indeno(1,2,3-cd)pyrene	20.0	BQL
15	Dibenzo(a,h)anthracene	0.60	BQL
16	Benzo(g,h,i)perylene	1.30	BQL

Comments:
Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit

POLYNUCLEAR AROMATIC
HYDROCARBONS (PNA)
SW-846 METHOD 8310-SPECIAL

CLIENT:	STS CONSULTANTS	DATE RECEIVED:	07/28/92
CLIENT PROJECT ID:	27313-XH	DATE SAMPLED:	07/27/92
IEA PROJECT ID:	CH920792	DATE ANALYZED:	08/05/92
IEA SAMPLE ID:	20792003	DILUTION FACTOR:	1.0
CLIENT SAMPLE ID:	118		
MATRIX:	SOIL		

Number	Compound	Quantitation Limit (ug/kg)	Results Concentration (ug/kg)
1	Naphthalene	100	BQL
2	Acenaphthylene	200	BQL
3	Acenaphthene	100	BQL
4	Fluorene	20.0	BQL
5	Phenanthrene	5.0	25
6	Anthracene	4.00	8.1
7	Fluoranthene	1.30	BQL
8	Pyrene	20.0	22
9	Benzo(a)anthracene	0.30	8.7
10	Chrysene	2.00	21
11	Benzo(b)fluoranthene	0.60	6.6
12	Benzo(k)fluoranthene	0.20	5.8
13	Benzo(a)pyrene	0.30	13
14	Indeno(1,2,3-cd)pyrene	20.0	BQL
15	Dibenzo(a,h)anthracene	0.60	BQL
16	Benzo(g,h,i)perylene	1.30	BQL

Comments:
Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit

iea

IEA PROJECT# CH920792
CLIENT PROJECT ID 27313-XH
MATRIX SOIL

OIL & GREASE
EPA METHOD 418.1
mg/kg

CLIENT ID	115	109	118	METHOD BLANK	
LAB ID	20792 001	20792 002	20792 003	TS0730	PQL
OIL & GREASE	37	14000	31	< 20	20
DATE EXTRACTED	07/30/92	07/30/92	07/30/92	07/30/92	
DATE SAMPLED	07/27/92	07/24/92	07/27/92		
DATE ANALYZED	08/04/92	08/04/92	08/04/92	08/04/92	
DILUTION FACTOR	1	100	1	1	

STS CHAIN OF CUSTODY RECORD

№ 14606 RECORD NO. ______ THROUGH ______

Contact Person Steve Bucker / Rich Berggreen
Phone No. 272 6520 Ext (2116) / Ext (2088)
Project No. 27313XH PO No.
STS Office North Brook

SPECIAL HANDLING REQUEST
- ☐ RUSH
- ☐ VERBAL
- ☐ OTHER

Laboratory IEA
Contact Person Jim
Phone No. (708) 705-0740
Results Due As Routine

Sample I.D.	Date	Time	Grab	Composite	No. of Containers	Sample Type (Water, soil, air, sludge, etc.)	Preservation Y	Preservation N	Field Data PID/FID Ambient	Field Data PID/FID Sample	PH	Spec. Cond.	Analysis Request	Comments on Sample (Include Major Contaminants)
108	7/28/92	2:00	X		3	soil		X					PAH, OG-TPH, VOC	12'6" – 14'6"

Collected by: [signature]	Date 7/29/92	Time	Delivery by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received for lab by: Jim Dowse	Date 7/29/92	Time 6:30	Relinquished by:	Date	Time

Laboratory Comments Only: Seals Intact Upon Receipt ☐ Yes ☐ No ☐ N/A

Final disposition:

Comments (Weather Conditions, Precautions, Hazards):

Distribution: Original and Green – Laboratory Yellow – As needed Pink – Transporter Goldenrod – STS Project File
Instruction to Laboratory: Forward completed original to STS with analytical results. Retain green copy.

11/90 FORM 038

STS CHAIN OF CUSTODY RECORD

№ 14609 **RECORD NO.** ______ **THROUGH** ______

Contact Person Dave Grumman Rich Berggren
Phone No. 272-6520 (2326) (2088)
Project No. 27313-XH PO No.
STS Office North Brook

SPECIAL HANDLING REQUEST
☐ RUSH
☐ VERBAL
☐ OTHER

Laboratory IEA Schaumburg
Contact Person
Phone No. (708) 705-0740
Results Due A.S.A.P

Sample I.D.	Date	Time	Grab	Composite	No. of Containers	Sample Type (Water, soil, air, sludge, etc.)	Preservation Y	Preservation N	Field Data PID/FID Ambient	Field Data PID/FID Sample	PH	Spec. Cond.	Analysis Request	Comments on Sample (Include Major Contaminants)
~~205~~ 115*	7/27/92	3:00	X		3	Soil		X					PAH, OG TPH, VOC	12'6" - 14'6"
109	7/24/92	4:30	X		3	Soil		X					PAH, OG TPH, VOC	12'6" - 14'6"
~~208~~ 118*	7/27/92	3:30	X		3	Soil		X					PAH, OG TPH, VOC	12'6" - 14'6"

Collected by: [signature]	Date 7/28/92	Time 6:55	Delivery by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received for lab by: Jim Dowse	Date 7/28/92	Time 6:55	Relinquished by:	Date	Time

Laboratory Comments Only: Seals Intact Upon Receipt ☐ Yes ☐ No ☐ N/A

Final disposition:

Comments (Weather Conditions, Precautions, Hazards):
* Sample ID changed - DLG 8/10/92

Distribution: Original and Green - Laboratory Yellow – As needed Pink – Transporter Goldenrod – STS Project File
Instruction to Laboratory: Forward completed original to STS with analytical results. Retain green copy.

11/90 FORM 038

Analytical Methodology

IEA utilizes approved environmental methodologies whenever possible and appropriate. Due to the varying nature of sample matrices submitted to our laboratories we utilize a wide variety of analytical methodologies and quality assurance protocols. Analytical results and Quality Assurance protocols employed by our network laboratories are based on guidelines specified in the following documents:

- "Methods of Organic Chemical Analysis of Municipal and Industrial Wastewater", Federal Register Vol. 49, No. 209, October 26, 1984;
- "Test Methods for Evaluating Solid Waste", SW-846 Third Edition, September 1986, USEPA;
- "Standard Methods for the Examination of Water and Wastewater" 1985, 14th, 15th and 16th Edition;
- "Methods for Chemical Analysis of Water and Wastes" March 1983, EMSL, EPA;
- "Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples", EPA 600/8-80-038, June 1980;
- Organic Analysis: Multi-media, Multi-Concentration-IFB-CLP, January 1991, Document Number OLM01.2 (plus revisions);
- Inorganic Analysis: Multi-media, Multi-Concentration-IFB-CLP, Document Number ILM01.0;
- "Handbook for Analytical Quality Control in Water and Wastewater Laboratories", EPA-600/4-79-019, March 1979;
- National Enforcement Investigation Center Policies and Procedures Manual, EPA-330/9/78/001-R, Revised May 1986
- "Manual for the Certification of Laboratories Analyzing Drinking Water", April 1990, EPA/570/9-90/008.

State Certifications

In some instances it may be necessary for environmental data to be reported to a regulatory authority with reference to a certified laboratory. For your convenience, the laboratory identification numbers for the IEA-Illinois laboratory are provided in the following table. Many states certify laboratories for specific parameters or tests within a category (ie. method 624 for wastewater). The information in the following table indicates the lab is certified in a general category of testing such as drinking water or wastewater analysis. The laboratory should be contacted directly if parameter specific certification information is required.

IEA-Illinois
Certification Summary, as of June 1992

State	Responsible Agency	Area of Certification	Lab Number
Connecticut	Department of Health Services	General Environmental	PH-0672
Illinois	Environmental Protection Agency	Drinking Water	100238
Tennessee	Department of Health and Environment.	Drinking Water	02962
Wisconsin	Department of Natural Resources	General Environmental	999756670

Definitions of Data Qualifiers and Terminology

There are a number of data qualifiers that are widely used within the environmental testing industry which may be utilized in our data reports. The following definitions of these qualifiers are included as a service to our clientele. The majority of the qualifiers have evolved from the EPA contract laboratory program (CLP) therefore, they may or may not be appropriate for the particular testing that you have requested. If your work did not involve CLP type analyses, only a few of these items may apply to your particular report.

A - This flag is utilized to indicate that a tentatively identified compound (TIC) is a suspected aldol-condensation product formed during sample processing and caution should be applied in interpreting these results.

B - This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to use caution when applying the results of this analyte.

BQL - Below quantitation limit indicates the compound was not detected in the sample above the practial quantitation limit.

C - Indicates that a pesticide identification has been confirmed utilizing GC/MS techniques.

D - Indicates the sample extract was diluted by the factor listed due to the sample matrix and/or concentration levels. All method detection limits or practical quantitation limits for the particular sample are therefore increased by this dilution factor.

E - Indicates that the concentration of the specific compound exceeded the calibration range of the instrument for that particular analysis.

J - Indicates an estimated value. It indicates that the compound was analyzed for and determined to be present in the sample. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meet the identification criteria but the result is less than the sample quantitation limit but greater than zero.

MDL - The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

ND - Indicates the compound or analyte was not detected in the sample above the method detection limit or the practical quantitation limit for the particular analysis.

PQL - The practical quantitation limit is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine operating conditions.

U - Indicates the compound was analyzed for but not detected in the sample above the applicable quantitation limit.

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CASE NARRATIVE
CH920792

Sample 109 required dilution due to high levels of hydrocarbons. PNA analysis was subcontracted because the initial request for 48 hour TAT could not be met internally. All samples were handled under internal and external chain of custody.

The turnaround time requested was changed to standard 2 weeks by Steve Bucher.

QUALITY ANALYTICAL LABS, INC.

Project #: 920476
Date : 09/17/92

STS Consultants Ltd.
1869 Techny Road
Northbrook, IL 60062

ATTN: Dave Grumman

Sampling Date: 09/05,06/92
Analyses Date: 09/08-17/92

Identification: Nine samples taken by Robert Bryce identified as:

PROJECT #27313-XH
STS/C.O.C. #14658

Completed report.

Results follow:

Sample ID: B-126

TCLP METALS
Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.1	BDL
Barium	0.1	1.0
Mercury	0.05	BDL

Sample ID: B-128

TCLP METALS
Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.1	BDL
Barium	0.1	1.1
Mercury	0.05	BDL

<u>Sample ID: B-130</u>

TCLP METALS
Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.1	BDL
Barium	0.1	1.1
Mercury	0.05	BDL

Sample ID: B-129

Method: Standard Methods

	MDL (mg/Kg)	Analysis
Paint Filter:		PASS
Acid Compatability:		Slight foaming
Base Compatability:		No Reaction
Water Compatability:		No Reaction
pH: (10% solution)		8.7
Open Cup Flashpoint:		>200^{0}F
Total Cyanide:	0.5	BDL
Reactive Cyanide:	0.5	BDL
Total Sulfide:	1.0	BDL
Reactive Sulfide:	1.0	BDL
Total Phenols:	2.5	BDL
EOX:	5.0	BDL

Method: GC/ECD

	MDL (mg/Kg)	Analysis
PCBs:	0.5	BDL

TCLP METALS
Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.1	BDL
Barium	0.1	0.2
Mercury	0.05	BDL

Sample ID: B-129 (cont'd)

F-SERIES
Method: SW-846 8240 (modified to capillary).

	MDL (mg/Kg)	Analysis (mg/Kg)
Acetone	0.10	BDL
Benzene	0.010	BDL
Carbon Tetrachloride	0.010	BDL
Carbon Disulfide	0.010	BDL
Chlorobenzene	0.010	BDL
ortho-Dichlorobenzene	0.010	BDL
Ethylbenzene	0.010	BDL
Ethyl ether	0.050	BDL
Isobutanol	0.075	BDL
Methylene Chloride	0.050	BDL
MEK (2-Butanone)	0.075	BDL
MIBK	0.050	BDL
Tetrachloroethylene	0.010	BDL
Toluene	0.010	BDL
111-Trichloroethane	0.010	BDL
112-Trichloroethane	0.010	BDL
Trichloroethylene	0.010	BDL
112-Trichloro-122-Trifluoroethane	0.010	BDL
Trichlorofluoromethane	0.010	BDL
Xylenes	0.025	BDL

F-SERIES SEMI-VOA's
Method: SW-846 8270

n-butyl Alcohol	1.0	BDL
Cresols	1.0	BDL
Cyclohexanone	1.0	BDL
2-Ethoxyethanol	1.0	BDL
Ethyl acetate	1.0	BDL
Nitrobenzene	1.0	BDL
2-Nitropropane	1.0	BDL
Pyridine	1.0	BDL

Method: GC/FID

Methanol	1.0	BDL

Sample ID: B-129 (cont'd)

TCLP VOLATILES
Method: SW-846 8240 (modified to capillary).

Parameter	MDL (mg/L)	Analysis (mg/L)
Benzene	0.005	BDL
Carbon tetrachloride	0.005	BDL
Chlorobenzene	0.005	BDL
Chloroform	0.005	BDL
1,2-Dichloroethane	0.005	BDL
1,1-Dichloroethylene	0.005	BDL
Methyl ethyl ketone	0.25	BDL
Tetrachloroethylene	0.005	BDL
Trichloroethylene	0.005	BDL
Vinyl chloride	0.005	BDL

TCLP ACID EXTRACTABLES
Method: SW-846 8270

Parameter	MDL (mg/L)	Analysis (mg/L)
o-Cresol	0.05	BDL
m & p-Cresol	0.05	BDL
Pentachlorophenol	0.05	BDL
2,4,5-Trichlorophenol	0.05	BDL
2,4,6-Trichlorophenol	0.05	BDL

TCLP BASE/NEUTRALS
Method: SW-846 8270

Parameter	MDL (mg/L)	Analysis (mg/L)
1,4-Dichlorobenzene	0.05	BDL
2,4-Dinitrotoluene	0.05	BDL
Hexachloroethane	0.05	BDL
Hexachlorobutadiene	0.05	BDL
Hexachlorobenzene	0.05	BDL
Nitrobenzene	0.05	BDL
Pyridine	0.05	BDL

Sample ID: B-131

Method: Standard Methods

	MDL (mg/Kg)	Analysis
Paint Filter:		PASS
Acid Compatability:		No Reaction
Base Compatability:		No Reaction
Water Compatability:		No Reaction
pH: (10% solution)		8.6
Open Cup Flashpoint:		>200^{0}F
Total Cyanide:	0.5	BDL
Reactive Cyanide:	0.5	BDL
Total Sulfide:	1.0	BDL
Reactive Sulfide:	1.0	BDL
Total Phenols:	2.5	BDL
EOX:	5.0	BDL

Method: GC/ECD

	MDL (mg/Kg)	Analysis
PCBs:	0.5	BDL

TCLP METALS
Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.1	BDL
Barium	0.1	0.1
Mercury	0.05	BDL

Sample ID: B-131 (cont'd)

F-SERIES
Method: SW-846 8240 (modified to capillary).

	MDL (mg/Kg)	Analysis (mg/Kg)
Acetone	0.10	BDL
Benzene	0.010	BDL
Carbon Tetrachloride	0.010	BDL
Carbon Disulfide	0.010	BDL
Chlorobenzene	0.010	BDL
ortho-Dichlorobenzene	0.010	BDL
Ethylbenzene	0.010	BDL
Ethyl ether	0.050	BDL
Isobutanol	0.075	BDL
Methylene Chloride	0.050	BDL
MEK (2-Butanone)	0.075	BDL
MIBK	0.050	BDL
Tetrachloroethylene	0.010	BDL
Toluene	0.010	BDL
111-Trichloroethane	0.010	BDL
112-Trichloroethane	0.010	BDL
Trichloroethylene	0.010	BDL
112-Trichloro-122-Trifluoroethane	0.010	BDL
Trichlorofluoromethane	0.010	BDL
Xylenes	0.025	BDL

F-SERIES SEMI-VOA's
Method: SW-846 8270

n-butyl Alcohol	1.0	BDL
Cresols	1.0	BDL
Cyclohexanone	1.0	BDL
2-Ethoxyethanol	1.0	BDL
Ethyl acetate	1.0	BDL
Nitrobenzene	1.0	BDL
2-Nitropropane	1.0	BDL
Pyridine	1.0	BDL

Method: GC/FID

Methanol	1.0	BDL

Sample ID: B-131 (cont'd)

TCLP VOLATILES
Method: SW-846 8240 (modified to capillary).

Parameter	MDL (mg/L)	Analysis (mg/L)
Benzene	0.005	BDL
Carbon tetrachloride	0.005	BDL
Chlorobenzene	0.005	BDL
Chloroform	0.005	BDL
1,2-Dichloroethane	0.005	BDL
1,1-Dichloroethylene	0.005	BDL
Methyl ethyl ketone	0.25	BDL
Tetrachloroethylene	0.005	BDL
Trichloroethylene	0.005	BDL
Vinyl chloride	0.005	BDL

TCLP ACID EXTRACTABLES
Method: SW-846 8270

Parameter	MDL (mg/L)	Analysis (mg/L)
o-Cresol	0.05	BDL
m & p-Cresol	0.05	BDL
Pentachlorophenol	0.05	BDL
2,4,5-Trichlorophenol	0.05	BDL
2,4,6-Trichlorophenol	0.05	BDL

TCLP BASE/NEUTRALS
Method: SW-846 8270

Parameter	MDL (mg/L)	Analysis (mg/L)
1,4-Dichlorobenzene	0.05	BDL
2,4-Dinitrotoluene	0.05	BDL
Hexachloroethane	0.05	BDL
Hexachlorobutadiene	0.05	BDL
Hexachlorobenzene	0.05	BDL
Nitrobenzene	0.05	BDL
Pyridine	0.05	BDL

Sampling ID: MW-128

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/L	Analysis mg/L
1,1-Dichloroethane	0.001	BDL
1,1-Dichloroethene	0.001	BDL
1,1,1-Trichloroethane	0.001	BDL
1,1,2-Trichloroethane	0.001	BDL
1,1,2,2-Tetrachloroethane	0.001	BDL
1,2-Dichloroethane	0.001	BDL
1,2-Dichloropropane	0.001	BDL
1,2,3-Trichloropropane	0.001	BDL
1,4-Dichloro-2-butene	0.001	BDL
2-Butanone (MEK)	0.050	BDL
2-Chloroethyl vinyl ether	0.001	BDL
2-Hexanone	0.010	BDL
4-Methyl-2-pentanone(MIBK)	0.005	BDL
Acetone	0.075	BDL
Acrolein	0.10	BDL
Acrylonitrile	0.10	BDL
Benzene	0.001	BDL
Bromodichloromethane	0.001	BDL
Bromomethane	0.005	BDL
Carbon disulfide	0.001	BDL
Chlorobenzene	0.001	BDL
Chloroethane	0.005	BDL
Chloromethane	0.005	BDL
cis-1,3-Dichloropropene	0.001	BDL
Dibromochloroemethane	0.001	BDL
Dibromomethane	0.001	BDL
Dichlorodifluoromethane	0.001	BDL
Ethylbenzene	0.001	BDL
Iodomethane	0.001	BDL
Methylbenzene (Toluene)	0.001	BDL
Methylene chloride	0.001	BDL
Styrene	0.001	BDL
Tetrachloroethene	0.001	BDL
Tetrachloromethane	0.001	BDL
trans-1,2-Dichloroethene	0.001	BDL
trans-1,3-Dichloropropene	0.001	BDL
Tribromomethane (Bromoform)	0.001	BDL
Trichloroethene	0.001	BDL
Trichlorofluoromethane	0.001	BDL
Trichloromethane (Chloroform)	0.001	BDL
Vinyl acetate	0.025	BDL
Vinyl chloride	0.005	BDL
Xylenes (Total)	0.003	BDL

Sampling ID: MW-129

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/L	Analysis mg/L
1,1-Dichloroethane	0.001	BDL
1,1-Dichloroethene	0.001	BDL
1,1,1-Trichloroethane	0.001	BDL
1,1,2-Trichloroethane	0.001	BDL
1,1,2,2-Tetrachloroethane	0.001	BDL
1,2-Dichloroethane	0.001	BDL
1,2-Dichloropropane	0.001	BDL
1,2,3-Trichloropropane	0.001	BDL
1,4-Dichloro-2-butene	0.001	BDL
2-Butanone (MEK)	0.050	BDL
2-Chloroethyl vinyl ether	0.001	BDL
2-Hexanone	0.010	BDL
4-Methyl-2-pentanone(MIBK)	0.005	BDL
Acetone	0.075	BDL
Acrolein	0.10	BDL
Acrylonitrile	0.10	BDL
Benzene	0.001	BDL
Bromodichloromethane	0.001	BDL
Bromomethane	0.005	BDL
Carbon disulfide	0.001	BDL
Chlorobenzene	0.001	BDL
Chloroethane	0.005	BDL
Chloromethane	0.005	BDL
cis-1,3-Dichloropropene	0.001	BDL
Dibromochloroemethane	0.001	BDL
Dibromomethane	0.001	BDL
Dichlorodifluoromethane	0.001	BDL
Ethylbenzene	0.001	BDL
Iodomethane	0.001	BDL
Methylbenzene (Toluene)	0.001	BDL
Methylene chloride	0.001	BDL
Styrene	0.001	BDL
Tetrachloroethene	0.002	BDL
Tetrachloromethane	0.001	BDL
trans-1,2-Dichloroethene	0.001	BDL
trans-1,3-Dichloropropene	0.001	BDL
Tribromomethane (Bromoform)	0.001	BDL
Trichloroethene	0.001	BDL
Trichlorofluoromethane	0.001	BDL
Trichloromethane (Chloroform)	0.001	BDL
Vinyl acetate	0.025	BDL
Vinyl chloride	0.005	BDL
Xylenes (Total)	0.003	BDL

Sampling ID: MW-130

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/L	Analysis mg/L
1,1-Dichloroethane	0.01	BDL
1,1-Dichloroethene	0.01	BDL
1,1,1-Trichloroethane	0.01	BDL
1,1,2-Trichloroethane	0.01	BDL
1,1,2,2-Tetrachloroethane	0.01	BDL
1,2-Dichloroethane	0.01	BDL
1,2-Dichloropropane	0.01	BDL
1,2,3-Trichloropropane	0.01	BDL
1,4-Dichloro-2-butene	0.01	BDL
2-Butanone (MEK)	0.50	BDL
2-Chloroethyl vinyl ether	0.01	BDL
2-Hexanone	0.10	BDL
4-Methyl-2-pentanone(MIBK)	0.05	BDL
Acetone	0.75	BDL
Acrolein	1.0	BDL
Acrylonitrile	1.0	BDL
Benzene	0.01	BDL
Bromodichloromethane	0.01	BDL
Bromomethane	0.05	BDL
Carbon disulfide	0.01	BDL
Chlorobenzene	0.01	BDL
Chloroethane	0.05	BDL
Chloromethane	0.05	BDL
cis-1,3-Dichloropropene	0.01	BDL
Dibromochloroemethane	0.01	BDL
Dibromomethane	0.01	BDL
Dichlorodifluoromethane	0.01	BDL
Ethylbenzene	0.01	BDL
Iodomethane	0.01	BDL
Methylbenzene (Toluene)	0.01	0.13
Methylene chloride	0.01	BDL
Styrene	0.01	BDL
Tetrachloroethene	0.02	BDL
Tetrachloromethane	0.01	BDL
trans-1,2-Dichloroethene	0.01	BDL
trans-1,3-Dichloropropene	0.01	BDL
Tribromomethane (Bromoform)	0.01	BDL
Trichloroethene	0.01	BDL
Trichlorofluoromethane	0.01	BDL
Trichloromethane (Chloroform)	0.01	BDL
Vinyl acetate	0.25	BDL
Vinyl chloride	0.05	BDL
Xylenes (Total)	0.03	0.31

Sampling ID: MW-131

VOLATILES Method: SW-846 8240 (Modified to capillary)

Parameter	MDL mg/L	Analysis mg/L
1,1-Dichloroethane	0.001	BDL
1,1-Dichloroethene	0.001	BDL
1,1,1-Trichloroethane	0.001	BDL
1,1,2-Trichloroethane	0.001	BDL
1,1,2,2-Tetrachloroethane	0.001	BDL
1,2-Dichloroethane	0.001	BDL
1,2-Dichloropropane	0.001	BDL
1,2,3-Trichloropropane	0.001	BDL
1,4-Dichloro-2-butene	0.001	BDL
2-Butanone (MEK)	0.050	BDL
2-Chloroethyl vinyl ether	0.001	BDL
2-Hexanone	0.010	BDL
4-Methyl-2-pentanone(MIBK)	0.005	BDL
Acetone	0.075	BDL
Acrolein	0.001	BDL
Acrylonitrile	0.001	BDL
Benzene	0.001	BDL
Bromodichloromethane	0.001	BDL
Bromomethane	0.005	BDL
Carbon disulfide	0.001	BDL
Chlorobenzene	0.001	BDL
Chloroethane	0.005	BDL
Chloromethane	0.005	BDL
cis-1,3-Dichloropropene	0.001	BDL
Dibromochloroemethane	0.001	BDL
Dibromomethane	0.001	BDL
Dichlorodifluoromethane	0.001	BDL
Ethylbenzene	0.001	BDL
Iodomethane	0.001	BDL
Methylbenzene (Toluene)	0.001	BDL
Methylene chloride	0.001	BDL
Styrene	0.001	BDL
Tetrachloroethene	0.001	BDL
Tetrachloromethane	0.001	BDL
trans-1,2-Dichloroethene	0.001	BDL
trans-1,3-Dichloropropene	0.001	BDL
Tribromomethane (Bromoform)	0.001	BDL
Trichloroethene	0.001	BDL
Trichlorofluoromethane	0.001	0.74
Trichloromethane (Chloroform)	0.001	BDL
Vinyl acetate	0.025	BDL
Vinyl chloride	0.005	BDL
Xylenes (Total)	0.003	BDL

Sample ID: MW-128 (cont'd)

PNA's Parameter	Method: SW-846 8310 MDL (mg/L)	Analysis (mg/L)
Acenaphthene	0.010	BDL
Acenaphthylene	0.010	BDL
Anthracene	0.0066	BDL
Benzo(a)anthracene	0.00010	0.00095
Benzo(a)pyrene	0.00020	0.00097
Benzo(b)fluoranthene	0.00018	BDL
Benzo(ghi)perylene	0.00076	BDL
Benzo(k)fluoranthene	0.00017	BDL
Chrysene	0.0015	BDL
Dibenzo(a,h)anthracene	0.00030	BDL
Fluoranthene	0.0020	0.0021
Fluorene	0.0020	BDL
Ideno(1,2,3-c,d)pyrene	0.00040	BDL
Naphthalene	0.010	BDL
Phenanthrene	0.0060	BDL
Pyrene	0.0027	BDL

Sample ID: MW-129 (cont'd)

PNA's Parameter	Method: SW-846 8310 MDL (mg/L)	Analysis (mg/L)
Acenaphthene	0.010	BDL
Acenaphthylene	0.010	BDL
Anthracene	0.0066	BDL
Benzo(a)anthracene	0.00010	BDL
Benzo(a)pyrene	0.00020	BDL
Benzo(b)fluoranthene	0.00018	BDL
Benzo(ghi)perylene	0.00076	BDL
Benzo(k)fluoranthene	0.00017	BDL
Chrysene	0.0015	BDL
Dibenzo(a,h)anthracene	0.00030	BDL
Fluoranthene	0.0020	BDL
Fluorene	0.0020	BDL
Ideno(1,2,3-c,d)pyrene	0.00040	BDL
Naphthalene	0.010	BDL
Phenanthrene	0.0060	BDL
Pyrene	0.0027	BDL

Sample ID: MW-130 (cont'd)

PNA's Parameter	Method: SW-846 8310 MDL (mg/L)	Analysis (mg/L)
Acenaphthene	0.10	BDL
Acenaphthylene	0.10	BDL
Anthracene	0.066	BDL
Benzo(a)anthracene	0.0010	BDL
Benzo(a)pyrene	0.0020	BDL
Benzo(b)fluoranthene	0.0018	BDL
Benzo(ghi)perylene	0.0076	BDL
Benzo(k)fluoranthene	0.0017	BDL
Chrysene	0.015	BDL
Dibenzo(a,h)anthracene	0.0030	BDL
Fluoranthene	0.020	BDL
Fluorene	0.020	BDL
Ideno(1,2,3-c,d)pyrene	0.0040	BDL
Naphthalene	0.10	0.37
Phenanthrene	0.060	0.087
Pyrene	0.027	BDL

Sample ID: MW-131 (cont'd)

PNA's Parameter	Method: SW-846 8310 MDL (mg/L)	Analysis (mg/L)
Acenaphthene	0.010	BDL
Acenaphthylene	0.010	BDL
Anthracene	0.0066	BDL
Benzo(a)anthracene	0.00010	0.00019
Benzo(a)pyrene	0.00020	0.00024
Benzo(b)fluoranthene	0.00018	BDL
Benzo(ghi)perylene	0.00076	BDL
Benzo(k)fluoranthene	0.00017	BDL
Chrysene	0.0015	BDL
Dibenzo(a,h)anthracene	0.00030	BDL
Fluoranthene	0.0020	BDL
Fluorene	0.0020	BDL
Ideno(1,2,3-c,d)pyrene	0.00040	BDL
Naphthalene	0.010	BDL
Phenanthrene	0.0060	BDL
Pyrene	0.0027	BDL

Sample ID: MW-128 (cont'd)

TOTAL METALS
Method: Standard Methods

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.05	BDL
Chromium	0.05	BDL
Lead	0.1	0.5
Selenium	0.2	BDL
Silver	0.05	BDL
Barium	0.05	0.33
Mercury	0.005	BDL

Sample ID: MW-129 (cont'd)

TOTAL METALS
Method: Standard Methods

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.05	BDL
Chromium	0.05	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.05	BDL
Barium	0.05	0.21
Mercury	0.005	BDL

Sample ID: MW-130 (cont'd)

TOTAL METALS
Method: Standard Methods

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.05	BDL
Chromium	0.05	0.06
Lead	0.1	1.8
Selenium	0.2	BDL
Silver	0.05	BDL
Barium	0.05	0.29
Mercury	0.005	BDL

Sample ID: MW-131 (cont'd)

TOTAL METALS
Method: Standard Methods

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.05	BDL
Chromium	0.05	BDL
Lead	0.1	2.9
Selenium	0.2	BDL
Silver	0.05	BDL
Barium	0.05	0.14
Mercury	0.005	BDL

PCBs/Liquid
Method: GC/ECD

Sample ID: (cont'd)	MDL (mg/L)	Analysis (mg/L)
MW-128	0.02	BDL
MW-129	0.02	BDL
MW-130	0.02	BDL
MW-131	0.02	BDL

MDL = Method Detection Limit
BDL = Below Detection Limit

Respectfully submitted,

Nicholas Cuzzone
Lab Manager
Quality Analytical Labs, Inc.

STS CHAIN OF CUSTODY RECORD

№ 14658 RECORD NO. ______ THROUGH ______

Contact Person: ROBERT BAYLE / DAVE GRUMMAN
Phone No.: (708) 272-6520
Project No.: 27313-XH PO No.
STS Office: NORTHBROOK ILL

SPECIAL HANDLING REQUEST
☐ RUSH
☐ VERBAL
☐ OTHER

Laboratory: QUALITY ANALYTICAL
Contact Person: MIKE KIMMEL
Phone No.: (708) 512-0061
Results Due:

Sample I.D.	Date	Time	Grab	Composite	No. of Containers	Sample Type (Water, soil, air, sludge, etc.)	Preservation Y	Preservation N	Field Data PID/FID Ambient	Field Data PID/FID Sample	Field Data PH	Field Data Spec. Cond.	Analysis Request	Comments on Sample (Include Major Contaminants)
27313-XH B-128	9-5-92		X			SOIL							TCLP RCRA METALS	5-DAY TURNAROUND
B-129	9-5		X										BFI GREENSHEET	
B-130	9-5		X										TCLP RCRA METALS	
B-131	9-5		X										BFI GREENSHEET	
B-126	?		X		3	SOIL							TCLP RCRA METALS	
27313XH MW128	9-6-92		X		7	WATER							RCRA TOTAL METALS VOC, PNA, PCB	
MW129	9-6-92		X		7									
MW130	9-6-92		X		7									
MW131	9-6-92		X		7									

Collected by: Robert Byer	Date 9-8-92	Time 09:30	Delivery by:	Date	Time
Received by: Fred Weel 2 coolers	Date 9/8/92	Time 09:45	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received for lab by:	Date	Time	Relinquished by:	Date	Time

Laboratory Comments Only: Seals Intact Upon Receipt ☐ Yes ☐ No ☐ N/A

Final disposition:

Comments (Weather Conditions, Precautions, Hazards):

Distribution: Original and Green – Laboratory Yellow – As needed Pink – Transporter Goldenrod – STS Project File

Instruction to Laboratory: Forward completed original to STS with analytical results. Retain green copy.

11/90 FORM 035

Confidential Client
Assessment of Hazardous Solid Waste Storage Risk

A nuclear fuel processing plant had treated low level radioactive waste by solidification and storage in steel drums. After a short period of time a number of the drums showed a substantial degree of swelling, and in view of the nature of the contents, the owners asked STS to determine the nature and condition of the contents prior to opening the drums.

Using a combination of dynamic and mechanical tests, STS was able to prove that the waste had not reliquified, and there was a very low risk of gas pressure build-up in the drums. The drums were then successfully opened with no spillage or gas release, confirming STS' analysis that the swelling was caused by uneven expansion of the solidification agent, probably caused by incomplete mixing.

Fermi National Laboratory
Tritium Contaminated Water Sampling
Batavia, Illinois

STS participated in the design, installation and sampling of a series of groundwater monitoring wells to explore for a potential release of tritium-enriched water at Fermi National Laboratory. The wells were installed at an angle, to facilitate sampling of a drainage system beneath the radiation source which had been installed to collect and contain any releases which might occur. Precise location and alignment specifications were required and complied with. Drilling methods required that no water be introduced, in order to minimize the potential dilution of the tritiated water which may have been present, and to constrain any migration. All equipment used was monitored for potential radiation contamination and was decontaminated before removal from the site. Samples were collected by STS personnel using dedicated sampling equipment to avoid potential cross contamination. Analysis was conducted at a subcontracted laboratory selected by Fermi Lab representatives.

Kerr-McGee Corporation
Radioactive Contamination Assessment
West Chicago, Illinois

STS was retained for a hydrogeological assessment of the firm's West Chicago processing facility. Contamination of a down-gradient municipal well prompted officials to institute a source evaluation for the contamination. STS' scope of services included a remedial investigation of the site. The facility which was formerly used as a uranium processing plant contained numerous waste tailing piles which were determined to be leaching low level radionuclei and volatile organic compounds into the groundwater. The investigation scope included the installation of over 40 stainless steel groundwater monitoring wells to determine groundwater flow direction and horizontal and vertical gradients. STS conducted extensive sampling to determine levels of contamination for contaminants. STS performed over 1220 soil borings for soil sampling and chemical analysis to define the extent of near surface and deep aquifer contamination. STS also conducted an extensive geophysical exploration program including resistivity soundings and profiling, electromagnetic inductance and ground penetrating radar surveys. STS performed extensive groundwater flow and solute transport modeling to predict steady state contamination transport using a variety of scenarios. STS' modeling indicated that the leaching of the waste tailings had contaminated the underlying groundwater table. The contaminants had migrated over time to the groundwater supplies of the down-gradient municipalities. STS crews worked under an exhaustive health and safety program developed by STS and Kerr-McGee.

Institute of Paper Science and Technology
Appleton, Wisconsin

STS conducted a subsurface exploration for the recovery of previously disposed radioactive tracer chemicals. Small quantities of Promethium-147, Silver-110, Carbon-14 and Tritium were disposed at the IPST facility in 1979. STS was contracted to locate and remove the materials which were reportedly disposed of in a container.

STS conducted a series of site surveys including Electromagnetic(EM), Ground Penetrating Radar(GPR) and a radiation survey using a Geiger-Mueller Radiation Survey Meter. Subsequent exploration included test pit trenching of identified target areas.

The materials disposed were reportedly exempt from regulation due to the small quantities, and were proposed to be removed as part of a real estate sale under consideration.